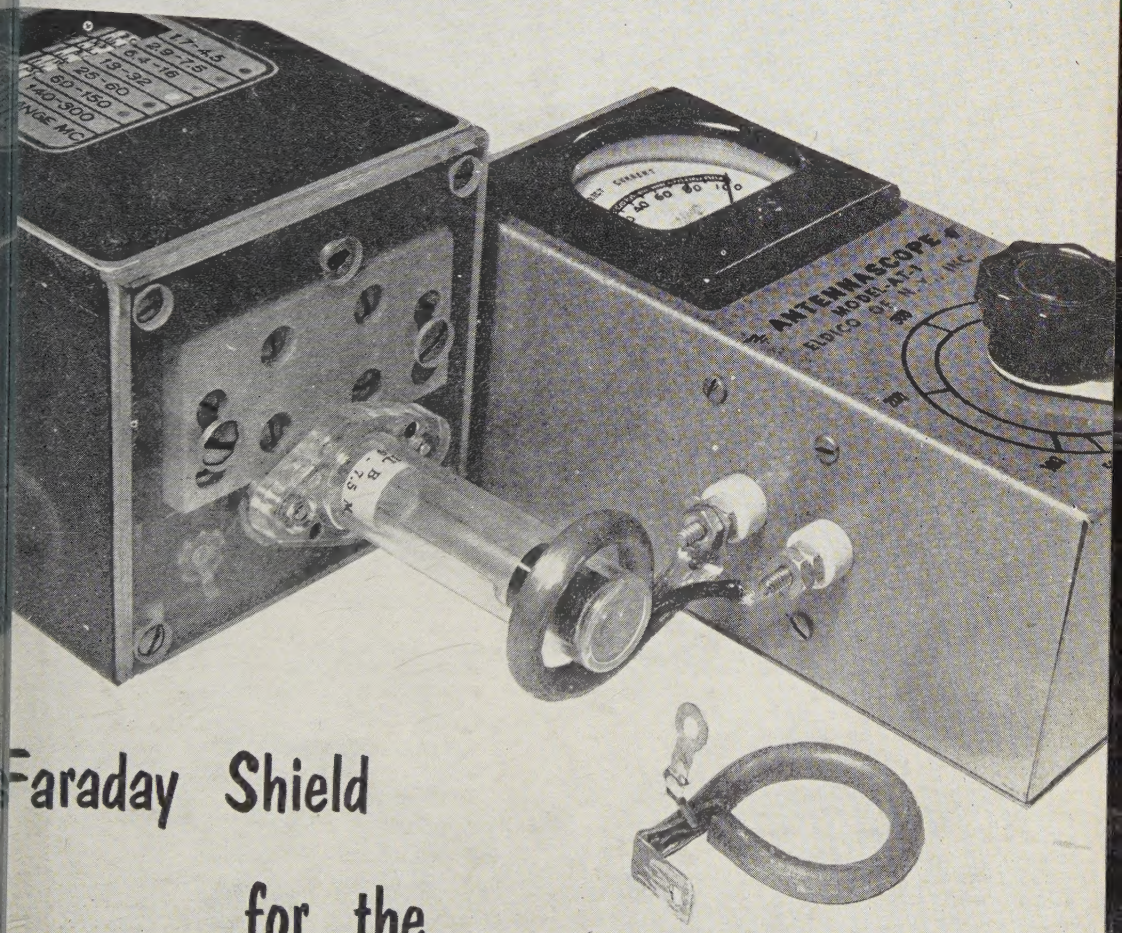
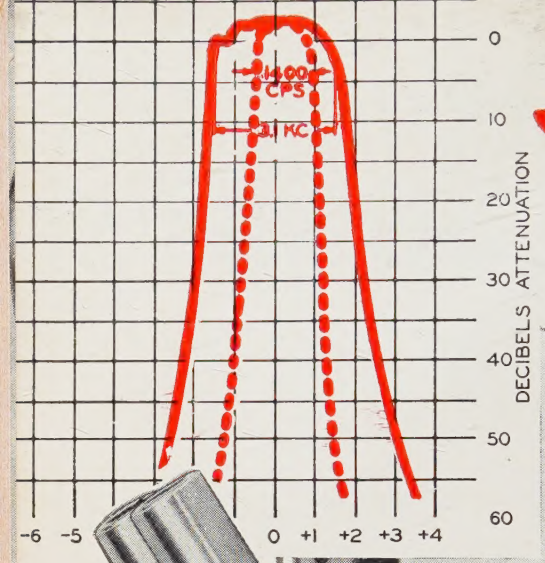
FEBRUARY
1954

CQ RADIO AMATEURS' JOURNAL

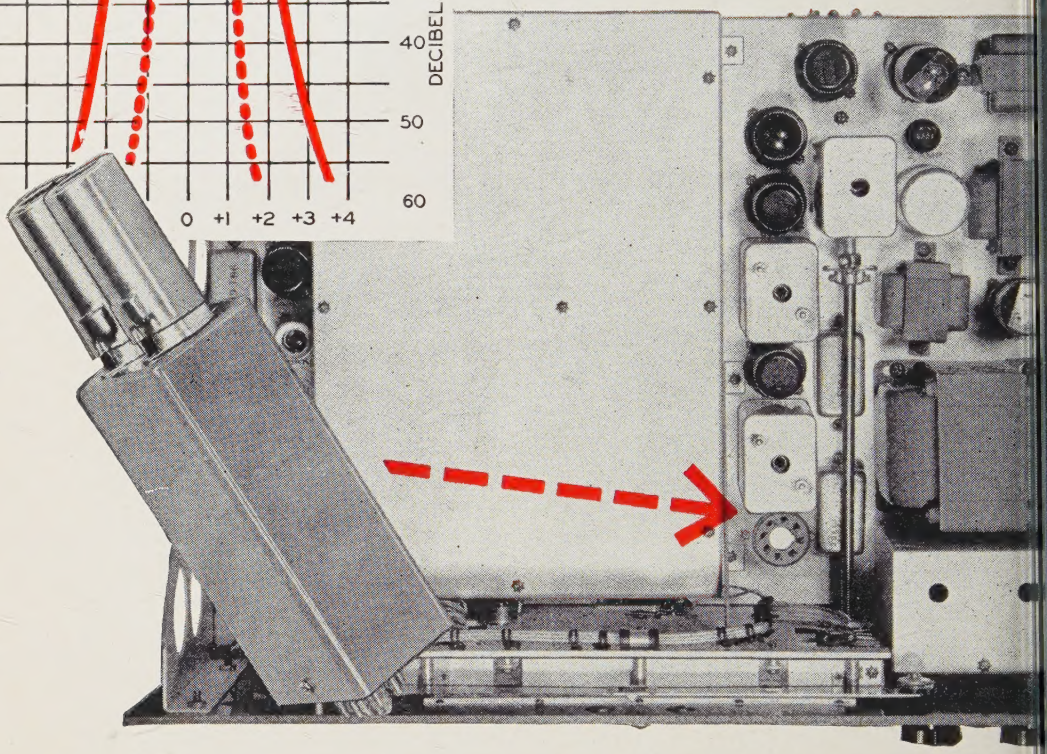


Faraday Shield for the ANTENNASCOPE

(see page 52)



Just plug it in



A Mechanical Filter for Your 75A-1!

IN A MATTER OF SECONDS your 75A-1 can be converted to incorporate the revolutionary new Collins mechanical filter! Just unplug the first 500 kc IF tube and plug in your choice of either the 1400 cycle or 3.1 kc unit. The 353C series plug-in adapter units for your 75A-1 will be available at your Collins distributor soon — contact him now for early delivery.

75A-2 OWNERS: Your Collins dealer now has 75A-2 mechanical filter conversion kits in stock. The 75A-2 kits are designed to be permanently wired into the set and include sockets for two plug-in mechanical filters. A type F455B-31 3.1 kc filter is included with each kit and a type F455B-08 800 cycle filter may be added at any time.

Type 353C-14 Plug-in Adapter, complete with 1400 cycle filter for 75A-1.....$ 75.00
Type 353C-31 Plug-in Adapter, complete with 3.1 kc filter, for 75A-1.....$ 75.00

Mechanical Filter Conversion Kit for 75A-2, complete with F455B-31 3.1 kc Filter....$ 80.0
Factory conversion of 75A-2, including installation of mechanical filter kit, minor repairs, and realignment.....$105.0

Plug-in filters for converted 75A-2's and new 75A-3's:

F455B-08, 800 cycle.....$ 55.0
F455B-31, 3.1 kc.....$ 55.0
F455B-60, 6.0 kc (available now).....$ 55.0

Solder Terminal Filters:

F455A-08, 800 cycle.....$ 55.0
F455A-31, 3.1 kc.....$ 55.0
F455A-60, 6.0 kc.....$ 55.0

NOTE: 353C-14 and 353C-31 Adapters incorporate 500 k solder terminal filters; they are designed for the 75A- receiver and will not operate in the 75A-2 or 75A-3.

COLLINS RADIO COMPANY, Cedar Rapids, Iowa

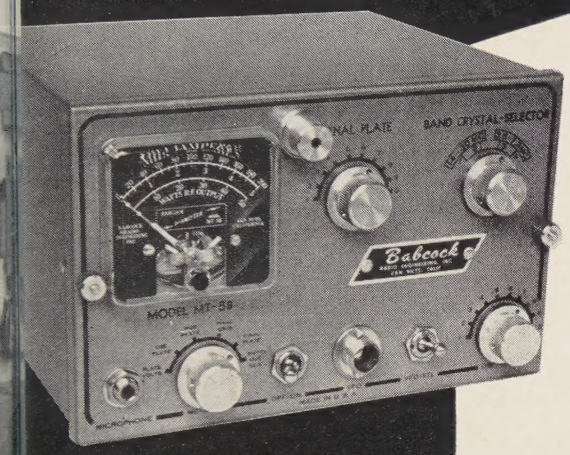
COLLINS

11 W. 42nd St.
NEW YORK 36

1930 Hi-Line Drive
DALLAS 2

2700 W. Olive Ave.
BURBANK

Go Mobile with Confidence



5 NEW FEATURES HAVE BEEN ADDED

1. NEW, exclusive clear-vision Meter with D'Arsonval Movement, providing most complete metering of all circuits.
2. Uses tubeless VFO which may be simply built from plans in instruction book.
3. NEW, extremely effective Crystal Oscillator Circuit using 6CL6 tube.
4. VFO-XTL Crystal Switch and VFO Connector now located on panel.
5. Alternate 6 and 12 volt wiring depending on power plug connection.

FINER SET IS EVER BUILT, IT WILL CARRY THE NAME...

NEW

BABCOCK

MOBILE D-X MITTER

Model MT-5B • 6 Band Bandswitching

Luxury Quality!

Professional Performance!

Low Cost!

A beauty—more than meets every demand! Designed for amateur use but built to most exacting commercial standards, with the rare skill and meticulous care that identifies world-renowned Babcock master craftsmanship.

Vibration-proof, shock-proof—the same rugged but high performance qualities that go into Babcock airborne and military radio equipment. Every part, every tube tied down to insure a steady, solid signal at all times. New and exclusive *time-tested* features, inside and out, provide the utmost in operating efficiency, simplicity and convenience.

All this, and more, in a sturdy 5x8x7" lifetime gray Hammertone baked enamel case—the smallest, most compact per watt output, most reliable unit available anywhere at any price. Inspect this new D-X Mitter—compare it—you'll never want any other!

Model MT-5B Babcock Mobile D-X Mitter, *includes tubes,* Ham Net **$119.50**

Babcock PS 4A 6VDC Dual Vibrator Power Supply, *includes vibrators, plugs, tubes.* Ham Net **$67.50**

●

Contact your nearest dealer or write direct for full details.

Manufactured and Fully Guaranteed by

BABCOCK RADIO ENGINEERING, INC.

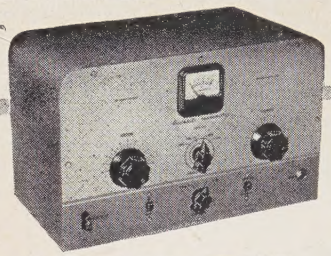
7942 Woodley Ave. • Van Nuys, Calif.

Export Dept., Frazar & Hansen, Ltd., 301 Clay St., San Francisco, Calif., USA

BABCOCK

The Ultimate in Mobile Radio

Heathkit AMATEUR TRANSMITTER KIT



Range	80-40-20-15-11-10 meters
6AG7	Oscillator - Multiplier
6L6	Amplifier - Doubler
5U4G	Rectifier
105-125 volts AC 50/60 cycles 100 watts	
Size — 8⅛" high x 13⅛" wide x 7" deep	

MODEL AT-1

$29.50

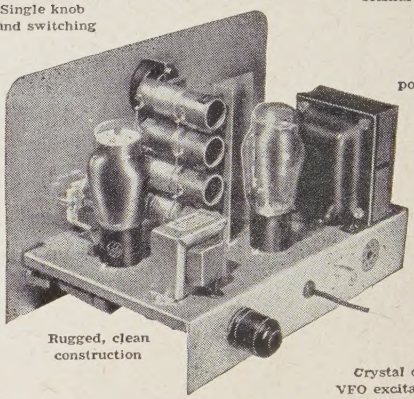
SHIPPING WT. 16 LBS.

Pre-wound coils — metered operation

52 ohm coaxial output

Single knob band switching

Built-in power supply



Rugged, clean construction

Crystal or VFO excitation

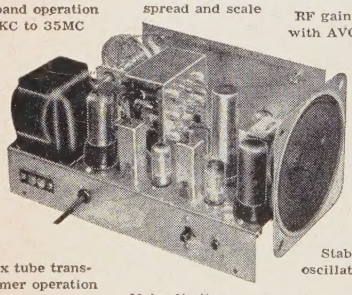
Here is the latest Heathkit addition to the Ham Radio field, the AT-1 Transmitter Kit incorporating many desirable design features at the lowest possible dollar-per-watts price. Panel mounted crystal socket, standby switch, key click filter, AC line filtering, good shielding, etc. VFO or crystal excitation-up to 35 watts input. Built-in power supply provides 425V @ 100MA. Amazingly low kit price includes all circuit components, tubes, cabinet, punched chassis and detailed construction manual. (Crystal not supplied.)

New HEATHKIT COMMUNICATIONS RECEIVER KIT

Four band operation 535KC to 35MC

Electrical band spread and scale

RF gain control with AVC or MVC



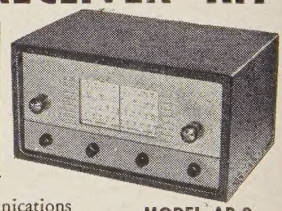
Six tube transformer operation

Noise limiter — standby switch

Stable BFO oscillator circuit

5½" PM speaker — headphone jack

Range	535KC to 35MC
12BE6	Mixer oscillator
12BA6	IF amplifier
12AV6	Detector - AVC - Audio
12BA6	BFO oscillator
12A6	Beam power output
5Y3GT	Rectifier
105-125 volts AC 50/60 cycles 45 watts	



A *new* Heathkit AR-2 Communications Receiver. The ideal companion piece for the AT-1 Transmitter. Electrical band spread scale for tuning and logging convenience. High gain miniature tubes and IF transformers for high sensitivity and good signal to noise ratio. Construct your own Communications Receiver at a very substantial saving. Supplied with all tubes, punched and formed sheet metal parts, speaker, circuit components, and detailed step-by-step construction manual.

MODEL AR-2

$25.50

SHIP. WT. 12 LBS.

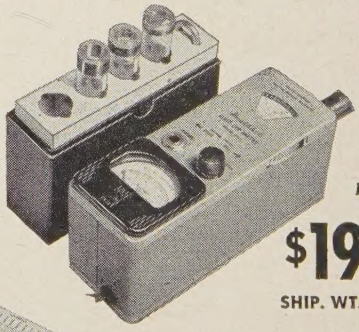
CABINET

Proxylin impregnated fabric covered plywood cabinet. Ship. wt. 5 lbs. No. 91-10. **$4.50**

THE IMPROVED Heathkit GRID DIP METER KIT

- **Pre-wound coil kit**
- **Range — 2MC to 250MC**
- **Meter sensitivity control**
- **Compact one hand operation**
- **Headphone monitoring jack**
- **Transformer operated**

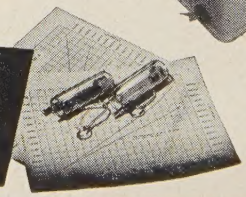
The invaluable instrument for all Hams. Numerous applications such as pre-tuning, neutralization, locating parasitics, correcting TVI, etc. Receiver applications include measuring C, L, and Q of components, determining RF circuit resonant frequencies, etc. Thumbwheel drive for convenient one hand operation. All plug-in coils are wound and calibrated (rack included). Headphone panel jack further extends usefulness to operation as an oscillating detector.



MODEL GD-1A

$19.50

SHIP. WT. 4 LBS.



Two additional plug-in coils are available and provide continuous extension of low frequency coverage down to 355KC. Dial correlation curves included. Shipping Wt. 1 lb. Kit 341. **$3.00**

HEATH COMPANY
BENTON HARBOR 6, MICHIGAN

CQ RADIO AMATEURS' JOURNAL

Vol. 10, No. 2
FEBRUARY, 1954

—(title Reg. U.S. Post Office)—is published ly by Cowan Publishing Corp. Executive Editorial offices, 67 West 44th Street, York 36, N. Y. Phone MUrray Hill 80. Reentered as Second Class Matter ary 6, 1951 at the Post Office. New N. Y. under the Act of March 3, 1879. cription rates in U.S.A. Possessions, APO O, 1 year $3.00; 2 years $5.00; 3 years O. Elsewhere add $1.00 per year for post- Single copies 35 cents. Printed in U.S.A.

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FEATURE ARTICLES

Departments

Miscellaneous

hallicrafters SX-88

ham news in years!

1. Heavy gauge steel welded chassis for mechanical stability.
2. Full precision gear drive for main and band spread tuning.
3. Six position Band Width Control (selectivity) from 250 cycles to 10 kc.
4. 10 watt inverse feed back and push-pull audio output.
5. Exalted B. F. O. for tops in single side band reception.
6. Buffer amplifier in B. F. O. circuit.
7. Antenna trimmer.
8. Amplified and delayed A. V. C.
9. Built-in 100 kc calibration crystal.
10. Second conversion oscillators crystal controlled.
11. Inertia tuning (fly wheels both dials).
12. Full frequency coverage from 535 kc to 33 mc.
13. Calibrated electrical band spread 160, 80, 40, 20, 15, 11, and 10 meters.
14. Logging scales on each tuning shaft.
15. Dial locks on each tuning shaft.
16. Tuning dial indicators resettable from front panel for maximum calibration accuracy.
17. Auxiliary A.C. socket on rear of chassis.
18. Illuminated band-in-use indicator.
19. Illuminated S meter.
20. Dual S meter calibration S units and microvolts.
21. Auxiliary power socket plus .6 amps at 6.3 volts and 10 ma at 150 volts for accessories.
22. Standard 8¾" by 19" panel for rack mounting if desired.
23. 50 kc i.f. output jack via cathode follower for teletype converter, etc.
24. Five position response control (tone control).
25. Two r.f. stages (Bands II to VI).
26. 17 tubes plus voltage regulator, ballast tube and rectifier.
27. Automatic noise limiter circuit.
28. Phono Jack.
29. Audio output transformer for 3.2, 8, 500/600 ohm loads.
30. Fuse for overload protection.
31. Auxiliary sensitivity control permits monitoring of local transmissions in standby position.

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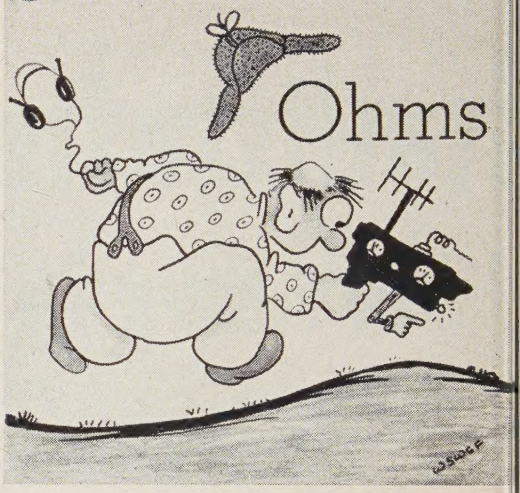
World's Leading Manufacturer of Communications and High Fidelity Equipment, Radio and Television

4401 West Fifth Avenue, Chicago 24, Illinois • Hallicrafters Ltd., 51 Camden Street, Toronto, Canada

Snorlock Ohms



Who Zero-Beated Sir Obie?

The great detective Snorlock Ohms and his phy sician-friend, Watts Gnu, were ushered into wealth and eccentric Sir Obie Quiet's sumptuous Ham shack Pierced through Sir Obie's leopard skin jacket were (1) an oriental dagger, (2) an occidental hatchet (3) a knife, and (4) a series of bullet holes oddl reminiscent of the schematic diagram of an induc tance coil.

Snorlock stroked heavy chin whiskers, disturbing robin that had laid three eggs. "This," he an nounced, "looks like murder."

"Astounding perception!" echoed Watts. "Bu now I see he's been knifed in the abdomen."

"Alimentary, my dear Watts, alimentary."

"But who could have done so heinous a deed?" inquired the butler. "I trust, sir, that you will no be influenced by mystery story writers and say 'th butler did it'."

The detective fastened gimlet eyes upon th menial, then returned the eyes to his sockets. With out a word, he strode to Sir Obie's 45-tube Ham re ceiver and observed the frequency on the slide-rul scale. It read 14,000½ kilocycles. "The person wh last worked Sir Obie on 20-meters is the murderer," he announced.

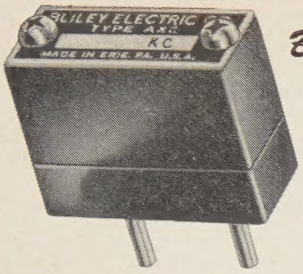
Watts' upper plate fell with a *clack*. "B-b-but," h spluttered like a short-circuited rectifier tube, "w already have full evidence of the foul deed here." He pointed to the lethal instruments. "Do you mean to imply he was murdered *over the air?*"

Snorlock smiled as one does to a six-year-old wh does not know the Einstein theory. "Look," he said removing the dead man's jacket, "not a mark o the body. The killer employed a ruse—rubber wea pons of the same type used by television comedians . . . Yes, you are right. We shall learn that Sir Obi was done away via 20-meter Ham radio."

"But-b-but how?" spluttered the butler, like tw rectifier tubes in short circuit.

"Tell me," evaded Snorlock, "was Sir Obie impres sionable—did he respond to suggestion?"

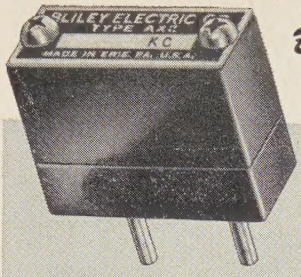
(Continued on page 8)



Bliley TYPE AX2

RANGE (kc)	TOLERANCE (kc)	PRICE
1803-1822 1878-1897 1903-1922 1978-1997	±1	$3.75
3500-3997	±5	$2.95
7000-7425 8000-8222	±5	$2.95
12500-13615 14000-14850	±30	$3.95

On crystals supplied to the tolerance above, the nameplate frequency is calibrated to ± .002% in factory test equipment. The drift is less than .0002% per °C.

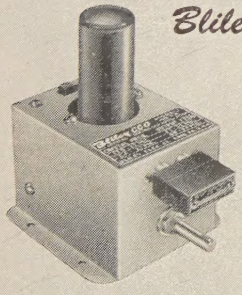


Bliley TYPE AX3

RANGE (kc)	TOLERANCE (kc)	PRICE
24000-24333 25000-25500	±5	$3.95

Specially designed third overtone crystal produced for the Bliley CCO-2A oscillator. On crystals supplied to the tolerance above, the nameplate frequency is calibrated to ± .003% in factory test equipment. The drift is less than .0002% per °C.

Bliley Crystals FOR 23 YEARS TOP AMATEUR CHOICE . . .

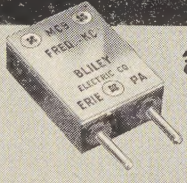


Bliley TYPE CCO-2A

This famous packaged oscillator unit was designed and engineered to utilize the many advantages of crystal control on 2-6-10-11 meters. With the CCO-2A, output is obtained directly on 6-10-11 meters; operation on 2 meters requires only a tripler stage.

Specified for 10 meters and 11 meters is the Bliley type AX2. For 6 meter operation, use Bliley type AX3. On 2 meters, select an AX3 crystal which will triple to the desired transmitting frequency.

PRICE: $11.95 (Less Tube and Crystal)

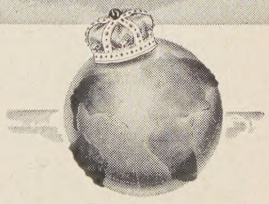


Bliley TYPE MC9

SPOT FREQUENCIES *for* NET OPERATION

RANGE (kc)	TOLERANCE (kc)	PRICE
ANY SPECIFIED FREQUENCY BETWEEN 3000-10000	±.03%	$4.80

On crystals supplied to the tolerance above, the nameplate frequency is calibrated to ± .002% in factory test equipment. The drift is less than .0002% per °C.



You will find these famous Bliley amateur products described in Bulletin 44-A—now available at your favorite distributor of amateur equipment.

Bliley CRYSTALS

BLILEY ELECTRIC COMPANY

UNION STATION BLDG., ERIE, PENNSYLVANIA

(from page 6)

"Very much so, sir," said the butler. "Once he was hypnotized into believing he was a dipper. All evening he dunked his head in a pail of water. Another time he was led to believe he was a fog horn. He kept us all up with the most fearful sounds. Still another time, he was hypnotized into believing he was an old-fashioned farm pump. He'd fill his mouth with water and then have me pump his arm. It was, well, decidedly unsanitary."

"Who," queried Snorlock, "was this person who exerted so great a power over Sir Obie's mind?"

"The eminent Sir Hypp Noah Twist. The two were great friends. Sir Hypp was also a radio Ham, and —good heavens!! You don't believe——?"

"I do," returned Snorlock. "Sir Hypp, the hypnotist, performed the foul deed by suggestion via radio. Sir Hypp was envious of the frequency used so successfully by Sir Obie. He, too, wanted to live, to breathe the rarified atmosphere of twenty meters' kilowatt corner, 14,000½ kilocycles. How he must have wanted to work DX on that coveted band edge. But always occupying the favorite corner was his hated rival, Sir Obie. There was only one thing for the mentally distorted hypnotist to do. Eliminate Sir Obie!"

Watts coughed. "I say, old man, you'll excuse my obtuseness, but I still do not know how Sir Obie met his end."

Snorlock gazed blandly at the three-element beam outside. "It's as elementary as that rotary beam. Sir Hypp hypnotized our defunct friend into believing he was a bleeder resistor. Note the power burns on the finger ends of Sir Obie's hand."

"By Jove——electrocuted!" exclaimed Watts. "I see——Sir Hypp zero-beated on Obie's frequency and gave him the business."

"But I'm still in the dark," said the butler, who had forgotten to take off his sun glasses.

"Elementary," explained Snorlock, "our friend met his end by his own hand. Sir Obie was hypnotized into believing he was a bleeder resistor. The natural location for a bleeder resistor is across the power supply. Well, when Sir Obie shunted his fingers across 1200 volts——you see the result." He glanced dramatically at the supine figure. "This case is closed," he ended.

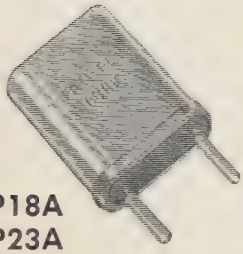
As casually as any private eye of the movies, Snorlock removed an old pipe from a voluminous pocket, tamped in a pound of his own formula "Stencho No. 69," ignited the portable furnace with a small blow torch, and staggered away, coughing violently.

New Work by MOBILE HANDBOOK Author

Undoubtedly many of CQ's readers follow the field of aviation as a second hobby, or perhaps as a livelihood. The hobby of aviation also has a following among the staff of CQ. A recent letter from W6SAI, William I. Orr (Author of the **Radio Amateurs' Mobile Handbook**, and Contributing Editor of CQ) reports that he has just completed two interesting sections for a new book in the aviation field: YEAR's **Pictorial History of Flight.** The book (published by the editors of YEAR, the Annual Picture History, Los Angeles 25, Calif.—$7.95) tells the complete history of aviation in some 1250 pictures and 75,000 words of text, and is now on sale in bookstores. W6SAI wrote the sections on guided missile development, and aircraft of the future. Noting the intriguing information regarding interplanetary flight in this book, we wonder who will be the first Ham to make a two way contact with a moon expedition.

SINCE WORLD WAR I

Working with spark . . . CW . . . phone . . . mobiles . . . as equipment progressed, the radio amateurs of this continent have, since World War I done a magnificent job of serving their communities when emergencies demanded a functioning standby communications system. The value of their contribution can never be fully measured, nor fully recognized.

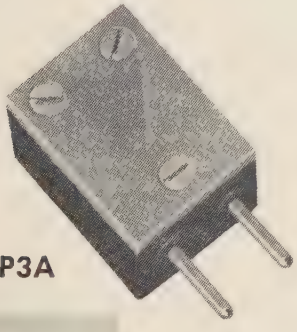


P18A
P23A

Full range of amateur frequencies. Holders have .09 pins, spaced ½ inch — to fit FT-243 sockets. P18A and P23A hermetically sealed, filled with dry nitrogen; silver-plated.

SINCE WORLD WAR II

Pan-El Crystals, made to a precision that is measured in Cycles rather than Kilocycles, were first produced in 1942. Our engineers have developed a process that assures long-term stability. You can count on Pan-El Crystals to keep you on the nose for years to come.



P3A

PRICES If your dealer does not stock Pan-El Crystals, write us and we will see you are served. In Boston area, see Radio Shack Corp.

80 meter band (P18A or P3A Holder)	$2.75
40 meter band (P18A or P3A Holder) (to the nearest 5 kc)	2.75
20 meter (3d overtone) (P23A Holder)	3.75
27.255 (3d overtone) (P23A Holder)	3.95
10 meter (3d overtone) (P23A Holder) (to the nearest 10 kc)	3.95

Pan-El

QUANTITY PRODUCERS OF STANDARD AND SPECIAL

Control Crystals

PAN-ELECTRONICS CORPORATION • 901 West Peachtree Street, N.E. Atlanta, Georgia

Eimac designed*, Eimac produced ...for Eimac QUALITY

Included in the incomparable list of Eimac developed electron-power tubes, which range to 9600mc and 25 kw power output, are six favorites of Amateur Radio Operators. Application-proved in many types of commercial and military service, the 4-65A, 4-125A, 4-250A, 4-400A and 4X150 radial-beam power tetrodes and 4E27A radial-beam power pentode possess the inherent features of Eimac multi-grid tubes—high power gain, minimized neutralization needs, and on-the-air economy. Mobile or shack, 2mc or 420mc, CW or phone, there's a tube in the Eimac Amateur's Big Six to do the job for you with a wallop. When visiting your distributor ask for Eimac—the mark of excellence in electron-power tubes.

Write our Amateur Service Bureau for further information.

*Eimac developed electron-power tubes

4-65A	75TL
4-125A	100TH
4-250A	100TL
4-400A	152TH
4-1000A	152TL
4PR60A	250TH
4W20,000A	250TL
4X150A	304TH
4X150D	304TL
4X150G	450TH
4X500A	450TL
4X500F	592/3-200A3
4E27A/5-125B	750TL
3K20,000LA, F, K	1000T
3K50,000LA, F, K	1500T
3W5000A3	2000T
3W5000F3	2-25A
3W10,000A3	2-50A
3X2500A3	2-150D
3X2500F3	2-240A
3X3000A1	2-2000A
3X3000F1	250R
25T	253
35T	8020(100R)
35TG	KY21A
75TH	RX21A

Eimac TUBES

EITEL-McCULLOUGH, INC.
SAN BRUNO, CALIFORNIA

Zero Bias...

If we had been a newspaper - - -

ARRL Executive Committee Meets

HARTFORD, Conn., Sept. 28 (CQ)—The Executiv Committee of the American Radio Relay League was in session today for a total of 52 minutes. This was one of their shortest meetings on record, although they considered the nomination petitions of 31 candidates in the forthcoming ARRL Directors election.

Six candidates were declared ineligible. Five petitions were denied because of insufficient continuity of membership and one because of an occupation in radio manufacturing.

The committee also affiliated 15 radio clubs with the ARRL and held an extensive discussion on the performance of the ROWH ceremonies at various Hamfests.

Attending the committee meeting were Messrs. Budlong, Houghton, Dosland and Noble. Absent were Roberts, Handy and Groves. Committee actions were unanimous.

ARRL Ordered to Show Cause

HARTFORD, Conn., Oct. 28 (CQ)—The Honorable Judge Charles S. House of the Hartford County Superior Court today granted a "show cause" order to the Rock Creek Amateur Radio Association against the American Radio Relay League.

The Rock Creek Association from Kensington, Md. has petitioned the court to hear arguments on the interpretation of Article 12 of the recently approved bylaws of the ARRL. The Rock Creek Association is said to be acting in behalf of three candidates declared ineligible on Sept. 28 by the ARRL Executive Committee for the office of Director of the Corporation.

Budlong Accepts Summons

HARTFORD, Conn., Nov. 2 (CQ)—The Secretary of the American Radio Relay League, A. L. Budlong, today is reported to have accepted the summons issued by Judge House of Hartford County Superior Court on the suit of the Rock Creek Amateur Radio Association.

The Rock Creek Association has filed in behalf of James W. John, W3OMN; John W. Gore, W3PRL and Paul M. Bossoletti, WØGZD. The plaintiffs claim that the "intent and spirit" of the ARRL Articles of Association has been violated. The Executive Committee of the ARRL recently declared the plaintiffs ineligible to be candidates for the office of Director and Vice-Director of the corporation.

A hearing has been set for Nov. 12 before Judge Louis Shapiro in the Hartford County Superior Court.

Rock Creek Plaintiffs Must File

HARTFORD, Conn., Nov. 12 (CQ)—The Superior Court today instructed the plaintiffs in the suit of the Rock Creek Amateur Radio Association against the American Radio Relay League to file written memorandum in support of their claims.

The ARRL was instructed to file a reply brief within one week thereafter.

Around the Courts

(A Gossip Column)

HARTFORD, Conn., Dec. 4—The suit of the Rock Creek Amateur Radio Association against the American Radio Relay League, a well-known local organization, resulted in a little conclave in Judge Shapiro's chambers this morning . . . The attornev for the plaintiff wanted the League held in Contempt of Court because they had not filed their reply brief until November 25 . . . However this was set aside and the League apparently agreed to set the elections aside should the Rock Creek Association finally win the suit.

HARTFORD, Conn., Dec. 28—Rumor has it that the American Radio Relay League yesterday replied to the brief filed by the Rock Creek Amateur Radio Association on December 18th . . . The latter group now represents John W. Gore, W3PRL who was in Hawaii on business when his ARRL membership dues fell due in September 1950 (the ARRL only accepts year-by-year membership) and is now claimed to have a 30 day lapse in membership, and Paul M. Bossoletti, WØGZD who also suffered a comparable lapse in membership . . . the plaintiffs stated on Dec. 18th that the wording of Article 12 of the ARRL By-Laws was such that any four year period of "continuous" membership should suffice. Gore has been a League member since 1930 and Bossoletti since 1943 . . . Just for the record, that disputed Article states, "No person shall be eligible for the office of Director, Vice-Director or President who has not been a member of the league for at least four years or who does not hold a valid authorization as a radio amateur . . ." To this columnist the League's By-Laws really have a loop-hole!!!

o. p. f.

the COMMAND SET ROUNDUP

HERB S. BRIER, W9EGQ

Undeniably the Most Popular Items of War Surplus Gear were the "Command Set" Receivers and Transmitters. Because of the Tremendous Interest They Still Have for Many of Our Readers We Take Pleasure in Presenting a Final-Final Conversion Article

In spite of the many articles published about "Command Sets" in the past several years *(See bibliography)*, there remains an insatiable appetite among new amateurs for conversion data on the *BC-274N* and *ARC-5* equipments.

Information on the following points is in demand:

1. Basic conversion data.
2. Power supply requirements.
3. Simple modification to crystal control for Novice use.
4. Modifying 4-5.3 Mc. *(BC-457)* and 5.3-7 Mc. *(BC-458)* units to cover amateur frequencies.
5. Transmitter de-TVI'ing information.
6. Receiver data.

This "final-final" article will attempt to assemble the above information in one place for the benefit of all concerned.

The Basic Transmitter Circuit

Although they have different nomenclatures and cover different frequency ranges, all "Command" transmitters utilize the basic circuit shown in *Fig. 1*. A 1626 variable-frequency oscillator drives an amplifier, consisting of a pair of 1625's in parallel. A 1629 "magic eye" tube, in conjunction with a quartz crystal, serves as a frequency calibrator.

A roller-type antenna coil, adjusted by means of a thumb wheel through the front panel permits using almost any *non-resonant* length of wire as a *Marconi* antenna. Antenna coupling is varied, also from the front panel, by a pivoted link coil inside the amplifier coil.

Rated transmitter input is about 90 watts on CW and half that on 'phone. All tubes have 12.6-volt filaments wired in series-parallel and operated from a 25-volt (nominal) d.c. source.

The two important differences between the *BC-* and *ARC-5* model transmitters are in the method of plate feed to the 1625's and the power sockets on the rear. In the *ARC-5's*, an r-f choke feeds the voltage directly to the plates, and a 0.0004-μfd. blocking condenser keeps the d-c voltage off of the tank coil. In the *BC*-models, the plate voltage is fed through the 1625 tank coil. This difference has no practical effect on the operation of the transmitters.

Of more immediate importance are the differences in the power sockets, which are noted in *Fig. 1*.

Adapting The Transmitters

Few amateurs have 25 volts of d.c. available; therefore it is necessary to modify the filament circuit of the transmitters for a-c operation. Either 12.6 or 25 volts may be used. For 25-volt operation, the modification entails three steps:

1. Remove the two resistors *(R70* and *R77)* connected to *pin 8* of the 1629 tube socket. Replace them with a single 2500-ohm, ½-watt resistor connected between *pin 8* and the chassis (ground).

2. Jam both relays *(K53* and *K54)* closed.

3. Mount a key jack in the lower right-hand corner of the front panel. Disconnect the 1625 cathodes from relay *K53* and the 51,000-ohm resistor *(R75)* across it. Connect the cathodes to the jack through a 50-ohm, two-watt resistor. Bypass the cathode of each 1625 tube *(pin 6)* to the metal shell of the tube socket with .005-μfd., 600-volt, disc ceramic condensers *(Centralab DD-502)*. The 50-ohm resistor eliminates the effect of having the "dots" on a slightly different frequency than the "dashes," as sometimes happens when a "bug" key is used.

Operating the filaments on twelve volts requires one additional step:

4. Ground *pin 7* of the remaining 1625 socket (one is already grounded). Tie *pin 1* of the two sockets together and to *pin 2* of the 1629 socket. Remove the 126-ohm resistor *(R71)*, which is connected across *pins 2* and *7* of the 1629 socket and mounted on the rear chassis wall. Transfer the wire connecting *pin 7* of the 1629 socket and the oscillator coil terminal strip to *pin 2* of the socket. Ground *pin 7* of the socket, and connect *pin 2* to the filament terminal on the power socket *(pin 6* on *BC*-models and *pin 5* on *ARC-5*'s.)

This completes the basic conversion.

Power Supply

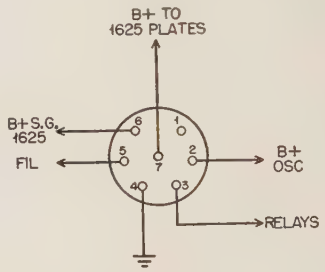
The power supply shown in *Fig. 2* will furnish all power for 75-watt operation of the "Command" transmitters. This level probably represents the best compromise between power output, signal quality, and power supply cost.

Oscillator plate voltage is relatively critical for best results. Approximately 200 volts gives essentially "zero-drift" operation. Either higher or lower voltage causes a frequency drift in one direction or the other. Actually, optimum voltage varies from transmitter to transmitter, but is usually quite close to 200 volts. Fortunately, a deviation of ten or fifteen volts does not degrade performance appreciably. Regulation of the oscillator plate voltage is highly recommended. Two VR-105 tubes in series may be used, between B+ and ground, as shown.

Six hundred volts a-c on the plates slightly exceeds the 550-volt maximum rating of the 5U4G rectifier tube, but such operation does not apparently reduce tube life, especially if the maximum current drawn does not exceed 200 milliamperes. Because the 5U4G is being slightly overloaded, fusing the primary circuit of the transformers is a wise precaution so that, should the tube arc over at the end of its useful life, the fuse and not the transformer will blow.

The transformer, *T1*, in the parts list is one of the very few available stock items that delivers sufficient plate voltage for our purpose and has two 6.3-volt filament windings that may be connected in series to provide 12.6 volts to light the tubes in the transmitter. Transformers with only a single 6.3-volt winding may be used in conjunction with an additional 6.3-volt, two-ampere filament transformer. Connect its primary in parallel with the primary of the plate transformer, and connect the two 6.3-volt windings in series.

The most desirable filter condenser for the power supply is an oil-filled, 1,000-volt unit,



ARC-5 Power Plug Connections.

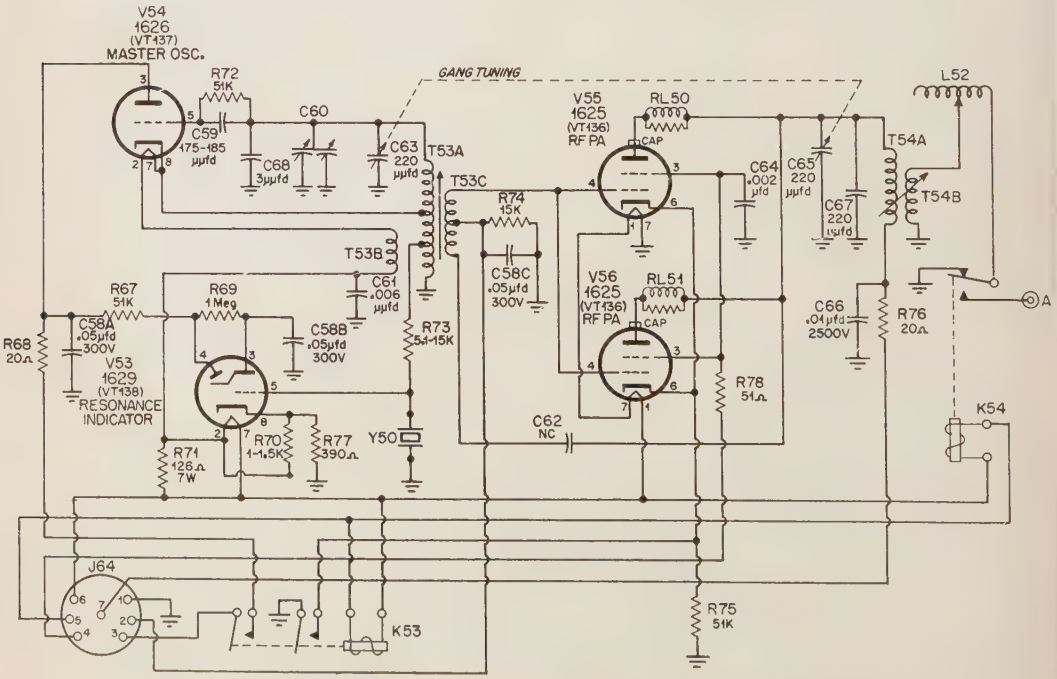


Fig. 1. Typical Command Set transmitter wiring schematic with power plug connections for the "BC-" series.

with a capacity of 4.0 μfd., or more. However, where economy is important, two 8.0 or 16.0-μfd. electrolytic condensers connected in series may be used, with 100,000-ohm 1-watt resistors across each one to equalize the voltage drops.

Probably the easiest way to bring power to the transmitter is through a five-conductor cable soldered directly to the transmitter power socket and terminated in a five-prong male plug for connection to the power supply. Proper terminals to use on the power socket are shown in *Fig. 1*.

To connect the cable to the transmitter, bare and tin about ½-inch of each conductor, and solder them into the appropriate terminals of the power socket. Fasten the cable to the back of the transmitter with a clamp to prevent straining the connections.

Operating and Tuning Up A Command Transmitter

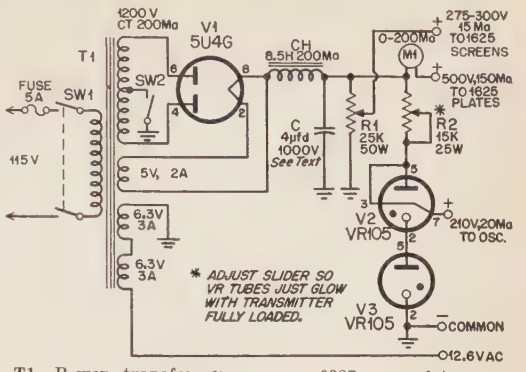
Operating a "Command" transmitter differs little from operating any other transmitter, except in the use of the crystal calibrator, which works in this manner: Normally, the "eye" of the 1629 tube is nearly closed, but when the 1626 oscillator is tuned to the frequency of the calibrating crystal, the "eye" opens to its full width. The transmitter dial reading should then be the same as the frequency marking of the crystal. If it is not, the calibration is corrected by inserting a screwdriver through the slide-covered opening in the transmitter cover and adjusting oscillator condenser *C68*.

Calibrating crystals of other frequencies can be substituted for the one furnished with the transmitter by plugging them into *pins 1* and *3* of the crystal socket.

To load a random length end-fed antenna, connect it to the antenna terminal and ground the transmitter case. Set the link coupling control to about half scale and rotate the antenna loading coil for maximum 1625 plate current, re-adjusting *C65* as necessary to keep the 1625 tank circuit tuned to resonance. Adjust coupling to draw the desired plate current.

Antenna lengths that are an integral multiple of ¼-wave long may be difficult to load, unless a 100-μμfd. variable condenser is available. Connect it *in series with the antenna* for lengths an odd multiple of a quarter-wave, and *between the antenna terminal and the case* for lengths that are multiples of a half-wave.

A center-fed doublet using a low-impedance line may be loaded by setting the rotary inductance to minimum inductance and connecting one antenna lead to the antenna post and the other to ground (chassis). Although this theoretically unbalances the antenna system, there does not seem to be any difference in results, on 3.5 and 7 Mc. If insufficient loading is obtained, even with the coupling control set to maximum, a few turns of well-insulated wire may be wound around the bottom (cold end) of the 1625 tank coil and connected in series with the link.



T1—Power transformer, 1200v., 200ma., ct.; 5v., 3amp.; 6.3v., 3amp.; 6.3v., 3 amp. (**Stancor** #8414 or equiv.)
Ch—8.5h., 200ma. (**Stancor** #C1721 or equiv.)
C—4 μfd. 1000v., oil filled (**Cornell-Dubilier** TJU, or equiv).
R1—25,000 ohms, 50w. with slider (**Ohmite** 0585 or equiv).
R2—15,000 ohms, 25w. with slider (**Ohmite** 0387 or equiv).
SW1—d.p.s.t. toggle.
SW2—s.p.s.t. toggle.
Fuse—5amp.
V1—5U4G
V2—OC3/VR105
V3—OC3/VR105
M1—200ma. milliameter (**Triplett** 227T or equiv).
Chassis—10 x 17 x 2" 3 octal tube sockets.
Note: meter may be mounted on power supply chassis or at transmitter.

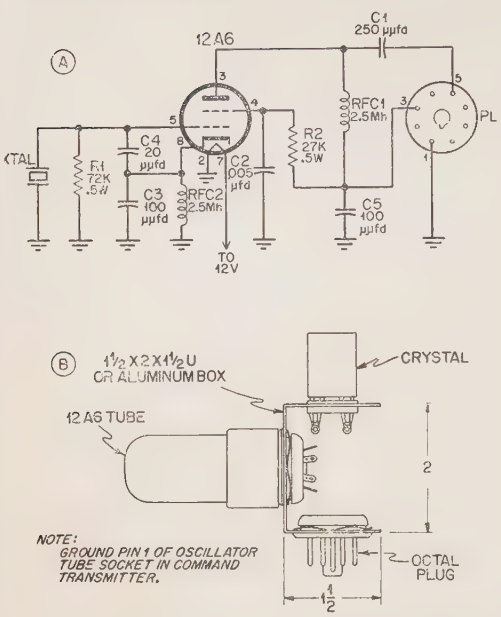
Fig. 2. Parts list and wiring schematic of a power supply suitable for use with the Command Set transmitters. Although the rectifier tube is slightly overloaded no damage should result if the primary of the transformer is fused. The oscillator voltage must be regulated for v-f-o operation.

Crystal Control

There are two methods of modifying "Command" transmitters for crystal control, which is mandatory for Novice operation. One is to rewire the oscillator for crystal control.[32] The other is to build a plug-in adapter.[21]

An adapter has the advantage that the transmitter is easily restored to variable frequency control by unplugging it and inserting the regular oscillator tube. The diagram *(Fig. 3)* is a modification of the previous adapter,[21] using a 12A6 tetrode in place of the original triode, since it is a more vigorous oscillator with "sluggish" crystals. However, the triode circuit also works well and uses fewer parts. To use the latter, omit *C2, C3, C4, R2,* and *RFC2,* and connect *pin 8* of the tube socket directly to the common ground point.

There are no special precautions required in constructing the adapter, except to position the octal plug so that the oscillator tube extends horizontally over the crystal and 1629 tube sockets when the adapter is plugged into the 1626 socket. Ground *pin 1* of the 1626 socket to use the adapter and connect the external filament wire from the adapter to the "hot" side of the filament supply. Apply not more than 250 volts to the oscillator B+ pin on the power socket. The voltage need not be regulated.



C1—250 μμfd. 600v. ceramic.
C2—.005 μfd. 600v. ceramic.
C3, C5—100 μμfd. 600v. ceramic.
C4—20 μμfd. 600v. ceramic.
R1—72,000 ohm ½w.
R2—27,000 ohm ½w.
RFC1, RFC2—2.5 mh. r-f chokes
PL—Octal plug, male (base of metal tube or Amphenol CP8).
VT—12A6 or 1626 (see text).
Xtal—3.5 or 7 Mc. crystal.
Built-in U bracket bent of aluminum or aluminum box approx. 1½ x 1½ x 2". To use adapter, ground pin 1 of 1626 tube in transmitter.

Fig. 3. This adapter may be used with any Command transmitter by following the instructions given in the text on the previous page. A partial structural view is shown in "B" and a schematic (parts list above) is shown in "A."

Without plate or screen voltage on the 1625's, adjust the main transmitter dial until the oscillator functions smoothly. Then apply voltage to the 1625's and resonate the 1625 tank circuit by adjusting *C65*. Antenna tuning and loading are described previously.

Utilizing the BC-457 and BC-458

So far, it has been assumed that 3-4 Mc. or 7-9.1 Mc. transmitters, which cover the 3.5 and 7-Mc., amateur bands, respectively, are available. However, 4-5.3 Mc. and 5.3-7 Mc. units are more plentiful and can be modified to cover these and other bands quite easily.

To cover the 3.5-Mc. band with a 4-5.3 Mc. *BC-457* unit, set the oscillator padding condenser *C60* (under the oscillator coil shield) to maximum capacity and re-resonate the 1625 stage with *C65*. The oscillator coil shield must be in place while this is being done.

The easiest way to cover the 7-Mc. band with a 5.3-7 Mc., *BC-458* unit is to decrease the capacity of both padding condensers just enough to permit covering the entire band. A better way is to short out three turns from the top of each coil, before adjusting the padders.

By shorting out the top turn on each coil, removing two rotor plates from each of the ganged condensers, and judiciously juggling the setting of the coil slugs and padders, it is possible to make the 7-Mc. band start at 6.0 on the dial and end at 6.3, giving direct frequency calibration by mentally adding *1* to the dial reading[19].

Covering Other Bands

Modifying the frequency range of "Command" transmitters to cover other bands requires changes ranging from working on the coils to completely rebuilding the unit. Some of the more-successful methods will be described briefly in the following few paragraphs, with full details to be found in the reference articles.

160 Meters: If the scarce 2.1-3 Mc. *BC-456* transmitter is available, set the padding condensers to approximately maximum capacity.[16] Otherwise, the coils of one of the higher-frequency units may be rewound. A new oscillator coil contains 36 turns of #20 enameled wire, with the cathode of the 1626 connected to the eighteenth turn. The 1626 filament wires *(pins 2* and *7)* are cut completely free of the oscillator coil. Disconnect the neutralizing condenser from the oscillator coil and move *R74* and *C58C* to that terminal. Set oscillator padder to maximum capacity. Rewind the amplifier coil with 34½ turns #18, enameled wire. Tune to resonance with *C65*.[22]

20 Meters: The simplest method of covering 14 Mc. with a "Command" transmitter is to use a 7-9.1 Mc. *BC-459* unit. Disconnect tuning condenser *C67*, and use *C65* to tune the 1625 stage as a 14-Mc. doubler. Disconnect neutralizing condenser from the oscillator coil. Move *R74* to that terminal. Replace *C58C* with an 0.002-μfd. mica condenser.[26] A much better method is to insert a frequency multiplier between oscillator and revamp the amplifier.[28]

15 Meters: With a 7-9.1 Mc. *BC-459* unit, add a frequency multiplier between the oscillator and amplifier. Rewind the amplifier coil to have 5 turns, double spaced.[18]

The conversions using an added multiplier stage may have it installed in the space originally occupied by the 1629 calibrator tube socket.

10 and 6 Meters: Operation on these bands requires practically a complete rebuilding job. The process has been described fully in several articles.[3, 15, 16]

Adding Another Stage To The Command Transmitter

Installing an untuned stage between the oscillator and the amplifier of a "Command" transmitter reduces reaction, resulting in better keying, which is discussed a bit later, and eliminates the possibility of frequency modulation when the 1625's are amplitude modulated for 'phone work. Also, as mentioned above, an extra frequency multiplier is usually required to operate the amateur bands above 7.3 Mc. *Figure 4* is a suitable circuit for either application.

A 2.5 mh. r-f choke acts as the plate load impedance when the stage is to be used as an isolating stage, and a slug-tuned coil is substituted for the choke when a frequency multiplier is required. The switch and coil shown in the dashed lines permits using the stage for either purpose. Of course, for this feature to be of any value, a similar switch must be added to the 1625 tank circuit. Then one transmitter may be used on two adjacent bands.

Rewire the crystal socket for the tube, mount the coil on a scrap of metal in place of the 1629 tube socket, and mount the switch on the rear or side lip of the chassis.

The simplest modification of the 1625 tank circuit for two-band operation is to mount another switch on the side of the chassis behind *C65* and *C67* (See *Fig. 1* and bottom photograph) and wire it so that when it is open, *C67* is out of the circuit. Resonance is obtained on the new frequency near minimum capacity of *C65*. It is convenient to add an external shaft and dial to *C65* for adjustment.

Alternatively, the switch may be mounted above the chassis and used to short out the top half of the turns on the amplifier coil *T54*. Resonance on either band will then occur at approximately the same setting of *C65*, depending upon how accurately the tap is placed. Ganged tuning of the oscillator and amplifier is retained. Also a more favorable L/C ratio in the tank circuit for harmonic discrimination is obtained.

De-TVI'ng The Command Set Transmitter

"Command" set transmitters are notorious TVI producers. However, there are tremendous differences in the TVI produced by apparently identical units. Some are very nearly "clean," and others are just the contrary. Also, the oscillator of one may be full of TVI, with the amplifier relatively clean, or vice versa, or both stages may contribute their share to the overall confusion.

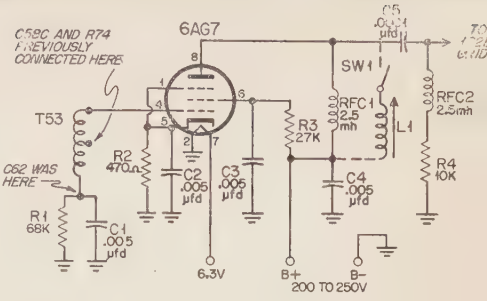
The first step in de-TVI'ing the transmitter is to improve the effectiveness of the bypassing under the chassis, and to cool off the power and key leads. The ingredients required are a handful of 0.005-μfd. disc ceramic condensers and about five feet of shielded wire. Carry out as many of the following steps as are necessary to clean up your troubles:

1. Bypass to ground each of the following points: screen grid of each 1625 *(pin 3)*, plate of 1626 *(pin 3)*, target of 1629 *(pin 3)*, the centertap of the 1625 grid coil, and the point where the filament voltage is fed into the oscillator coil. Disconnect and remove the three-section, 0.05-μfd. condenser *(C58)* mounted on rear lip of the chassis.

2. Replace the leads from the power socket to the various points within the transmitter with shielded conductors, grounding the shield wherever possible throughout its length, especially at each end. At the same time, shorten all ground leads as much as possible and remove unused components and conductors. In low TV-signal areas, it is also desirable to bypass each terminal of the power socket with a 0.005-μfd. disc ceramic condenser. The important point in installing these bypasses is to keep their lead length to an irreducible minimum.

3. With the bottom plate in place, the bottom of the transmitter is quite well shielded even though there is a theoretical possibility of r-f leakage along the crack between the edge of the chassis and the plate. Use all screws and press the plate firmly into place while tightening them.

4. Another good method of improving the shielding is as follows: Remove the rotary antenna coil and cover the holes in the front panel with a piece of scrap aluminum. Next, bend a piece of bronze screening, 12 x 15 inches, into a trough to fit inside the cover. Then solder another piece across the open back of the trough. When the cover is screwed into place, the screen is clamped firmly between it and the chassis. Pay particular attention to the openings near the rear of the cover at the bottom. They may be sealed off by soldering the edge of the screening at this point.



C1, C2, C3, C4—0.005 μfd. 600 v. disc ceramics.
C5—0.0001 μfd. mica or ceramic.
L1—Wound on National XR-50 or equiv. slug-tuned forms 7 Mc. 20 T. #20, enam. close wound. 14 Mc. 10 T. #20, enam. spaced to occupy ½ inch. 21 Mc. 7 T. #20, enam. spaced to occupy ½ inch. (One only required.)
R1—68 K, ½w.
R2—470 ohms, 2w.
R3—27 K, 1w. (May be varied to adjust excitation to 1625's).
R4—10 K, ½w.
RFC1, RFC2—2.5 mh. 50 ma. radio-frequency chokes.
SW1—S.p.s.t rotary switch, preferably ceramic insulated (Centralab 2043 or equiv.) A similar switch is used in the 1625 stage, described in text.

Fig. 4: Diagram of an isolating stage or frequency multiplier which may be substituted in the frequency calibrator stage space of "Command" transmitter. Referring to Fig. 1, the wire between the oscillator coil (T53) and the 1625 grids is removed from the grids and connected to pin 4 of the 6AG7 socket and the output of the 6AG7 connected to the 1625 grids. Other changes required are to remove the 1625 neutralizing condenser (C62) and disconnect C58C and R74 from the oscillator coil terminal strip. Connect R1 and C1 to the terminal to which C58C was previously connected. When only an isolating stage is required, L1 and SW1 are omitted, and when only a frequency multiplier is required, L1 is substituted for RFC1, SW1 again being omitted.

5. Other methods of improving the shielding of the cover include backing up the ventilating louvres with perforated sheet metal and sealing the tube-access openings on the top with electronic weatherstripping.[44]

6. Undoubtedly the most efficient way to keep harmonic energy out of the antenna circuit is to substitute a coaxial fitting for the original output terminal and feed the antenna through a low-pass filter, in conjunction with an antenna tuner if necessary. Any conventional link-coupled antenna tuner may be used. Also, by remounting the original rotary coil on a small metal base and link coupling it to the transmitter, it will function in much the same fashion as it did before being removed from the transmitter.

After the coil is remounted, close wind a three-turn link of stiff, well-insulated wire (about #16) of a diameter just sufficient to slip over the rotary coil. Slip the link coil over one end of the rotary coil, with the link fitting between the coil and the rod upon which the roller slides. Terminate the link winding in a coaxial cable chassis fitting mounted on the base on a small angle plate. The fitting serves the dual purpose of supporting the link winding and bringing r-f power from the transmitter to the tuner.

Ground the end of the rotary coil under the link winding and connect the roller to the antenna. Adjustment and limitations of the loading coil will be as already described, but with the possibility of inserting a low-pass filter in the link line for further attenuation of harmonic output from the transmitter.

Alternate Keying Methods

The problem of which is the best method of keying "Command" transmitters has caused more hair tearing than any other question. When operated conservatively, excellent keying can be obtained on 3.5 Mc., and good keying on 7 Mc. On the higher frequency bands, however, keying is seldom better than passable, unless a frequency multiplier has been inserted between the oscillator and power amplifier in the course of the modification, and if only the 1625's are keyed.[18, 28]

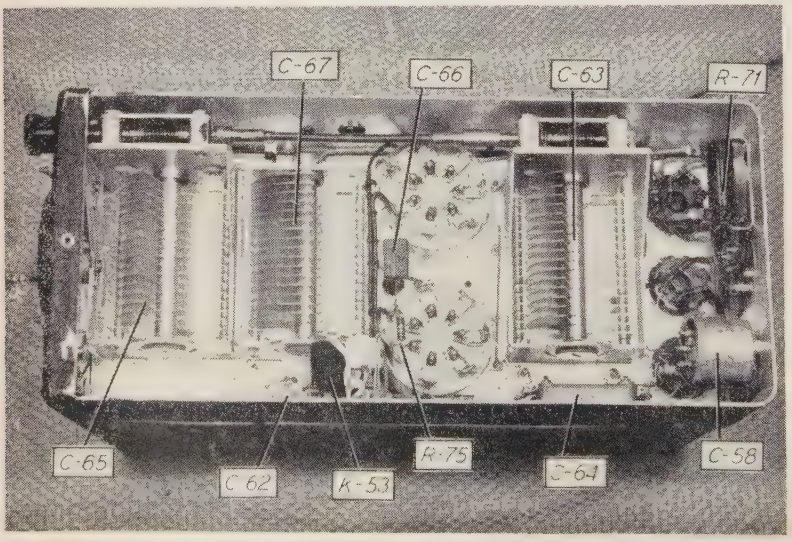
In our opinion, on 3.5 and 7 Mc., straight cathode keying of the 1625's is as good as any type, and better than some. It suffers the disadvantage of not permitting "break-in." Keying the oscillator permits "break-in" operation, but almost invariably accentuates chirps. Expedients used to permit oscillator keying include keying the B— lead of the power supply,[34] keying oscillator B+ and amplifier screens simultaneously through a relay,[14, 31] and replacing the jumper between *pins 7* and *8* on the 1626 socket with a 0.002-μfd. condenser and connecting *pin 8* to the key jack through a 2.5-mh. r-f choke.[13]

Modulation

The transmitters work well on phone at inputs of approximately fifty to sixty watts. In fact, many amateurs run considerably higher power than this on phone, without too much trouble. For an input of fifty watts, any modulator capable of delivering twenty-five watts of audio power may be used. Assuming a 1625 tube plate voltage of 500 volts and a total current of 100 milliamperes, the modulation transformer should be capable of matching the plate load impedance of the modulator tubes to a 5000-ohm load. The screens of the 1625's should be modulated as well as the plates. This is most easily accomplished by feeding the screen voltage through a 10-henry, 50-milliampere filter choke, which will allow them to be self-modulated.

Command Receivers

The most commonly available "Command" receivers are the *BC-453,* covering 190-550 kc; the *BC-454,* covering 3-6 Mc; and the *BC-455,*



Bottom view of the typical Command type transmitter.

covering 6-9 Mc. They all use the same, basic, six-tube circuit, with the filaments of the 12.6-volt tubes wired in series-parallel for operation from twenty-five volts.

As in the case of the transmitters, there are both *BC-* and *ARC-5* models, but the only important difference between them is that the *ARC-5* receivers use a 12SG7 tube in the second i-f stage, while the *BC* models use a 12SK7 tube.

The receivers are quite sensitive and stable, but the two units that cover the amateur 3.5 and 7-Mc. bands leave much to be desired from the selectivity standpoint. Nevertheless, they make excellent "first" or standby receivers. The bibliography contains many references to articles describing how to cover these and other bands with "Command" receivers.[2, 6, 8, 9, 17, 19, 20, 33, 35]

The *BC-453*, 190-550 kc., receiver has proved to be an extremely useful gadget around many amateur shacks. It uses an 85-kc., i-f amplifier, which is very selective. By tuning the main dial to 455 kc., the standard intermediate frequency of most communications receivers, and using a wire connected to the antenna post of the *BC-453* with the other end wrapped loosely around the lead from the last i-f transformer to the second detector in the communications receiver, the combination becomes an extremely selective "dual-conversion" receiver.[25]

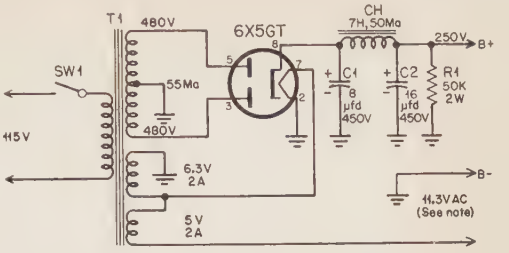
Some amateurs however, just take the i-f transformers from the *BC-453* to build a selective i-f channel in less space.[24, 27]

Modifying The Receivers

To use the receivers in amateur service entails adding a gain control, a beat-oscillator switch and a phone jack, and building a power supply.[2, 35] Also, as it is easier to obtain 12.6 volts than twenty-five volts, it is usually necessary to rewire the filaments in parallel for twelve-volt operation. When this is done, the six-volt equivalents of the original tubes may be substituted and the receivers then operated from a six-volt filament source.[3, 17, 19, 38]

The logical place to mount the new gain control, phone jack, and beat-oscillator switch is on the front panel in the space occupied by the adapter box. Remove the screws holding the box in place. Unplug it and remove the aluminum box holding the socket into which the adapter plugged. Mark the wires that were connected to *pins 1, 4,* and *5*. Remove the rest. Cover the hole in the panel with a flat piece of aluminum upon which is mounted a midget, 25,000-ohm wire-wound potentiometer, flanked by a s.p.d.t. toggle switch and a small phone jack.

Ground the middle terminal of the potentiometer and one terminal of the switch to the ground lug of the phone jack. Connect the *No. 1* wire to the *left-hand* terminal of the potentiometer (viewed from the back with terminals down), wire *No. 5* to the switch, and wire *No. 4* to the phone jack.



NOTE: REVERSE CONNECTIONS TO ONE FILAMENT WINDING, IF THIS VOLTAGE IS VERY LOW.

T1—Power transformer. 480v., 55ma., c.t., 5v., 2amp.; 6.3v., 2amp. (**Stancor** PC-8402 or equiv.)
Ch—7 h., 50ma. filter choke. (**Stancor** C-1707 or equiv.)
C1, C2—dual 8 µfd., 450v. electrolytic.
R1—50,000 ohm, 2w.
SW1—s.p.s.t. toggle.
Octal tube socket
6X5GT tube
7 x 7 x 2" chassis
Additional receiver conversion parts:
25,000-ohm, wire-wound pot. small size.
S.p.s.t. toggle switch.
Single-circuit phone jack

Fig. 5. Wiring schematic and parts list of a power supply unit suitable to operate the Command Set receivers.

To rewire the filaments of tubes, ground one filament pin of each tube socket and connect the other filament pins of each socket together and to *Pin 2* of the three-terminal plug at the rear of the receiver. *Pins 2* and *7* are the filament terminals on all tubes, except the 12SR7 and 12SG7, on which they are *pins 7* and *8*.

Connect power to the three-terminal plug thusly: B— and one side of the filament circuit to *pin 1;* twelve volts, a.c., to *pin 2;* and 200 to 250 volts, d.c., at fifty milliamperes, to *pin 3*.

WARNING! Do not apply more than 250 volts to the receiver; otherwise there is danger of blowing some of the condensers in it.

Figure 5 is the diagram of a power supply suitable for use with "Command" receivers. It is conventional, except for the 6X5 rectifier tube and the use of two filament windings connected in series to operate the tubes in the receiver. The total of 11.3 volts is a little low but it will satisfactorily operate the receiver.

Obviously, this article just scratches the surface of the vein of information available on the use of "Command" equipment, but we hope that, combined with the bibliography, it serves a useful purpose.

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(Continued on page 60)

Design of a Screen Supply

By WILLIAM I. ORR, W6SAI/FP8AC
Contributing Editor, CQ

In This Extensive Treatment of an Important Subject the Well-Known Author of the "RADIO AMATEURS' MOBILE HANDBOOK" Discusses the Development of Tetrode Screen Voltage Supplies

There's no doubt about it. The swing is to the use of low-drive pentodes and tetrodes in the final stages of amateur and commercial transmitters. Low grid drive requirements and the ease of applying anti-TVI measures make these high gain tubes attractive to the builders of new equipment. The inherent crankiness of some of the old style pentodes is absent in the newer versions, which are rugged, reliable and efficient.

Unfortunately, the tube designers have yet to produce a tetrode transmitting tube that does not require a source of screen voltage. This abruptly confronts the all-triode man with a unique new problem: How best to get a screen voltage source for a tetrode?

Various Screen Supplies—Good and Bad

The wrong type of screen supply can lead to many operating headaches, and may under certain circumstances, lead to the destruction of the tube itself. For purposes of illustration, let us assume that we are going to use a single 4-250A tube in the final stage, running at 3000 volts and 330 ma. for an input of 990 watts on CW. According to the data sheets on this tube, the maximum screen dissipation for this service is 35 watts. If the power dissipated by the screen exceeds this figure, the temperature of the screen will become excessive, and there is danger that the heat generated will warp the fragile screen structure, causing it to short to the grid or plate of the tube. Such an accident as this can happen in the wink of an eye, when the screen dissipation is allowed to exceed the maximum level during tuning operations, or by carelessly applied screen voltage.

There are two popular types of screen supplies in common use: (1) The supply wherein the screen voltage is obtained from the plate circuit high voltage supply by means of a suitable dropping resistor, and (2) the separate low voltage screen supply. Let us examine each type of supply and judge their respective merits and deficiencies.

The Series Resistor Supply

The 4-250A screen requires 500 volts at a current of about 45 ma. for c-w operation. Proper operation of the 4-250A may be had with screen currents of 25 to 60 ma. with equal values of grid drive. Unfortunately, the screen is operating very near the point of maximum dissipation when a current of 60 ma. is drawn, leaving very little "margin for error." It is better to operate the screen at a lower value of current, and accept the fact the tube is slightly harder to drive. The difference in driving power is less than 10%, in any case.

To drop 3000 volts to 500 volts at a current of, say 45 ma. requires a 55,000-ohm resistor capable of dissipating 110 watts. As long as the 4-250A remains in a static operating condition of 990 watts input, everything will be fine. But suppose the exciter of the 4-250 is keyed, or the input to the tube is changed slightly during a quick QSY? If the tube has the correct cut-off bias (120 volts) and the exciter is keyed, the screen current will drop to zero with no excitation. The voltage drop across *R1* will therefore be zero, and the screen voltage will be 3000 volts! This is six times the recommended maximum screen voltage. Undoubtedly the tube, and *C1*, the screen bypass condenser, will suffer drastically!

When the input to the tube is varied slightly as by tuning changes, the screen current will also vary. In fact, the screen current meter on a tetrode is the most sensitive indicator of proper tube operation. If the stage is loaded too heavily, the screen current will drop. If the loading is too light, the screen current will be excessive. A change in plate current of 50 ma. will often double or halve the screen current.

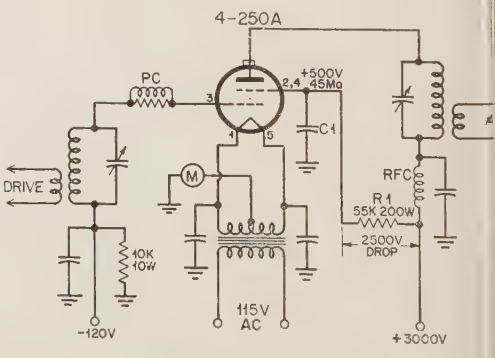


Fig. 1. This is the basic circuit of a 4-250A tube operating with a series screen supply for C-W operation. The voltage shown are those when excitation is applied to the tube.

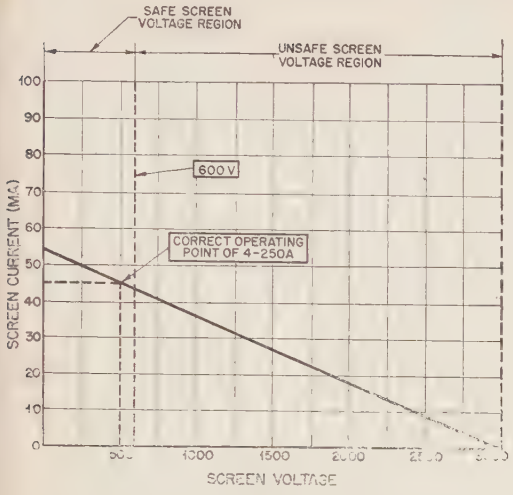


Fig. 2. Plot of screen voltage as a factor of screen current for the basic circuit in Fig. 1.

graph of screen voltage plotted against screen current for the circuit of *Fig. 1* is shown in *Fig. 2*. It can be seen that the screen voltage is extremely sensitive in terms of screen current, and therefore very dependent upon antenna loading, grid drive, and other circuit parameters. If the screen current should drop from 45 ma. to 30 ma. (which it could easily do with a slight change in antenna loading) the screen voltage would soar to 1300 volts! In fact, a drop of screen current from 45 ma. to 40 ma. would boost the screen voltage to 750 volts. Such a current sensitive screen supply is much too dangerous to use on large, expensive transmitting tubes, as the chance of damaging the screen is great.

On the other hand, when the screen current is excessive, the screen voltage drops quickly. 10% excessive screen current will drop the screen voltage to about 250 volts.

A circuit of this type may be used with small tubes such as the 807, where the plate voltage is not much greater than twice the screen voltage, but where the plate/screen voltage ratio is higher, as in the case of the 4-250A or tubes of that type, the circuit is exceedingly impractical—and dangerous to use.

The Series Resistor/Clamp Tube Supply

To prevent the screen voltage gyrations under "keyed" conditions, a clamp tube may be added to the circuit of *Fig. 1*. When excitation is applied to the 4-250A, and it is running at 990 watts input, the currents and voltages are as shown in *Fig. 3*. Resistor bias may be used on the tetrode, instead of a bias pack. The 180-volt bias developed across *R2* by the flow of rectified grid current is applied to the control grid of a tetrode-connected 6Y6 clamper tube. The plate of the 6Y6 is tied directly to the screen of the 4-250A. Under these conditions, the 6Y6 is biased beyond cut-off and is effectively out of the circuit. When the exciter stages are keyed, and the rectified grid current flow is interrupted, no voltage will be developed across *R2*, and there is no bias on the 6Y6. Consequently it draws a heavy plate current. This current drain boosts the voltage drop across *R1*, and the screen voltage of the 4-250A (as well as the plate voltage of the 6Y6) drops to a very low value. This action protects the screen of the 4-250A tube, as well as *C1*. Thus as the excitation rises and falls, so does the screen voltage, by the action of the 6Y6. This would seem like an ideal arrangement, but it also has some serious drawbacks:

1. If the 4-520A stage has any v-h-f parasitics that would cause it to draw grid current and develop voltage across *R2* during periods of no excitation, there will be no safety action of the clamp tube. In failing to act, the clamp tube could allow damage to the screen of the 4-250A.
2. The clamp tube is essentially a "yes or no" device, either operative or inoperative (just like a switch) and offers no protection to the tetrode under unfavorable operating parameters. If the excitation to the 4-250A remains constant, but because of changes in plate loading, the screen voltage drops to, say, 40 ma., the screen voltage will still rise to 750 volts. It would even be possible for the screen current to drop to an even lower value under excessive antenna loading, and allow the screen voltage to soar to 1500 or 2000 volts. In addition to damaging *C1*, the 6Y6 tube would probably be ruined.

So it can be seen that the clamp tube offers only marginal protection in the best of cases, and may offer no protection to the tetrode at

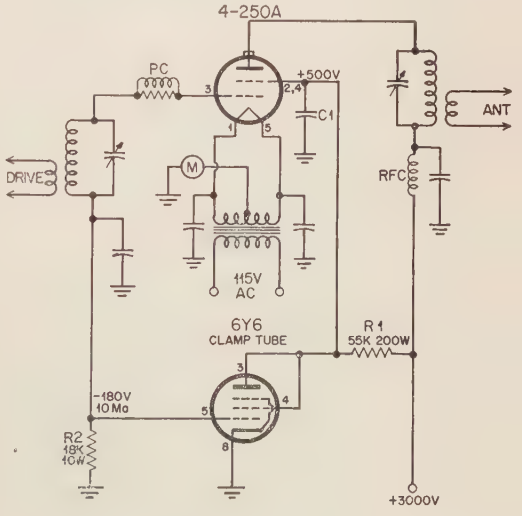


Fig. 3. In this basic circuit the 4-250A tube now has a screen clamper tube across the series resistor supply. The voltages are those that might be expected under normal excitation conditions.

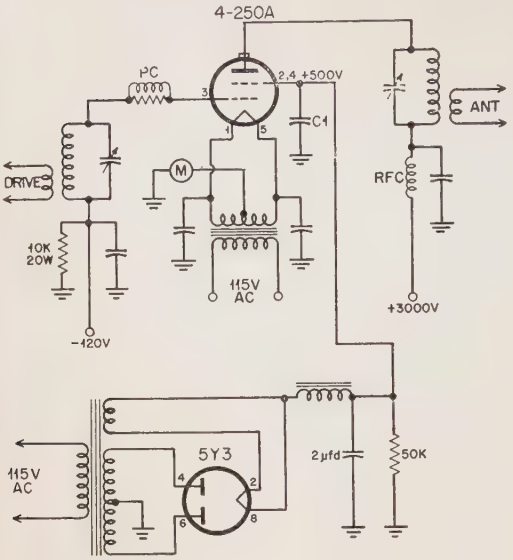


Fig. 4. Another alternative method is to provide screen voltage from a small power supply of reasonably good regulation. The disadvantages are mentioned in the text.

a time when the tetrode may be easily damaged.

The Low Voltage Screen Supply

A third type of screen supply is the low-voltage (see *Fig. 4*) power supply, which insures much better regulation than the series resistor type. When the excitation is removed from the tetrode, or the plate loading is changed, the screen current will still fluctuate over a large range. However, because of the better regulation of the low voltage screen supply, as compared to the series resistor supply of *Fig. 1*, the screen voltage will vary only a small amount, perhaps 30 or 50 volts. This will eliminate the danger of excessive screen voltage when little screen current is drawn.

Even so, this supply is not fool-proof, and can damage a perfectly good tube. Assume again that our 4-250A is coasting along at 990 watts input, and the overload relay on the high-voltage supply kicks out from an accidental arc-over, or that perhaps an 866 konks out and blows a line fuse on the high-voltage supply. With full screen voltage on the tube, and excitation, but no plate voltage, the screen current rises to perhaps five or ten times its normal value (limited only by the capacity of the screen supply). There is a slightly metallic "ping" as the red-hot screen expands and warps against the grid of the 4-250A, and po-o-o-oof! This process takes about 0.1 second,

TUBE	MAX SCREEN VOLTS	MAX SCREEN DISSIPATION (WATTS)
4-65A	400	10
4-125A	400	20
4-250A	600	35
4-400A	600	35
813	400	20
803	500	30

Table I. Maximum screen voltage and screen dissipation ratings far various popular transmitting tetrodes and pentodes in r-f service.

much quicker than you can hit the standby switch! If you have one 4-250A in the final it is bad enough; if you have two of them—(censored-*Editor*).

So it can be seen that none of these commonly used circuits offer 100% protection for the costly 4-250A. Either there is danger of excessive voltage or excessive current during tuning periods, or during keying. What actually is needed is a supply that will limit *both* current and voltage to the screen circuit. In other words, a *wattage limited* supply.

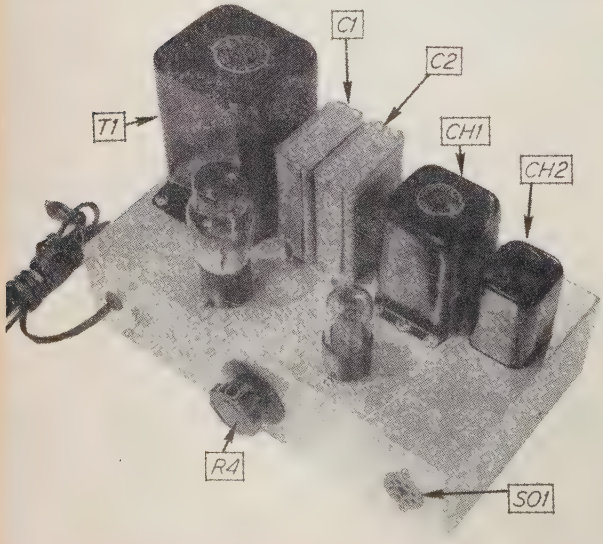


Fig. 5. The wattage-limited supply designed by the author for protection of pentode and tetrode final r-f amplifiers. Although shown here on an individual chassis the idea might easily be incorporated in the regular power supply deck of the transmitter.

A Wattage Limited Screen Supply

The maximum screen voltage and dissipation ratings of various tetrode transmitting tubes are listed in *Table 1*. If these ratings are always observed, the tube will be protected from screen overloads caused by keying or tuning maladjustment. What is needed is a screen supply of sufficiently poor regulation to allow the screen voltage to drop slowly as the screen current is increased, but at the same time not produce excessive voltage when the screen current is low. The introduction of a small amount of series resistance into a low-voltage supply of good regulation will do the trick. By the proper choice of this series resistor, the maximum wattage output of the supply may be set below the maximum dissipation of the screen grid of the tetrode tube. As the screen current then increases, the screen voltage drops, always keeping the screen dissipation within safe limits. As the screen current drops, the screen voltage rises, but not to excessive values. In this way the transmitting tube is adequately protected in all cases. The wattage output of the supply may be changed as desired by varying the series resistor.

A supply of this type, combined with a safety bias supply is illustrated in *Fig. 5*, and the schematic is shown in *Fig. 6*. This supply is intended for use (as shown) with a single 4-250A or 4-400A, and will deliver 500 volts at 45 ma., or a maximum of 35 watts power. The actual voltage, current and wattage curves are shown in *Fig. 7*. When two 4-250A tubes are used, *T1* and *Ch1* must be increased in size (see parts list) and *R1* decreased in value. If smaller tubes such as 813's or 4-125A's are used, *T1* and *Ch1* remain as shown, and *R1* is increased in value, since these tubes have less allowable screen dissipation.

To permit proper operation of *R1*, condenser input is used in the supply, and a power transformer with a 900-volt c-t winding is used. The number of small transformers that will deliver 600 volts out of a condenser input filter at load currents up to 100 ma. is limited. Our recommendation is the *Chicago Corp.* line of *PSR* transformers for this application. If the supply is for one tetrode, with a screen current of 60 ma. or less, the *PSR-80* transformer may be used. For two tetrodes, and a maximum screen current of 120 ma., the *PSR-120* transformer may be used. The current ratings of the transformers as given in the catalog are for continuous duty with reactor-input filter systems. Approximately the same ratings seem to apply under intermittent operation when a condenser input filter system is used.

A separate 6X5 half-wave rectifier is used as a bias supply, delivering about −130 volts. If a different value of bias is required, *R2* and *R3* may be changed in value. *R3* is the grid bias resistor for the tetrode tube, and its value may be computed from the tube data sheets. Once *R3* is determined, *R2* may be adjusted to pro

C1, C2—4.0 μfd., 600-volt, oil filled, Cornell Dubilier TJH-6040.
C3, C4—8.0/8.0 μfd, dual unit with separate negative leads, Sprague TU-88.
C5—0.001 μfd., ceramic, Erie 801-001.
C6, C7—0.001/0.001 μfd., dual unit, ceramic, Erie 812-001.
C8, C9—same as above.
Ch1—12 henries at 85 ma., Chitran #RS-1085.
Ch2—15 henries at 40 Ma., Chitran #RS-1540.
R1—2000 ohms, 50 watt with slider.
R2—6000 ohms, 20w., fixed.
R3—10,000 ohms, 20w., fixed.
R4—35 ohms, 50w., Ohmite Model J.
R5—200,000 ohms, 1w.
S1—S.p.s.t. switch
So1—8-prong octal socket.
T1—900 volts, c.t., 105 ma., 5 volts at 2 amps, 6.3 volts at 3.5 amp., Chitran PSR-105.

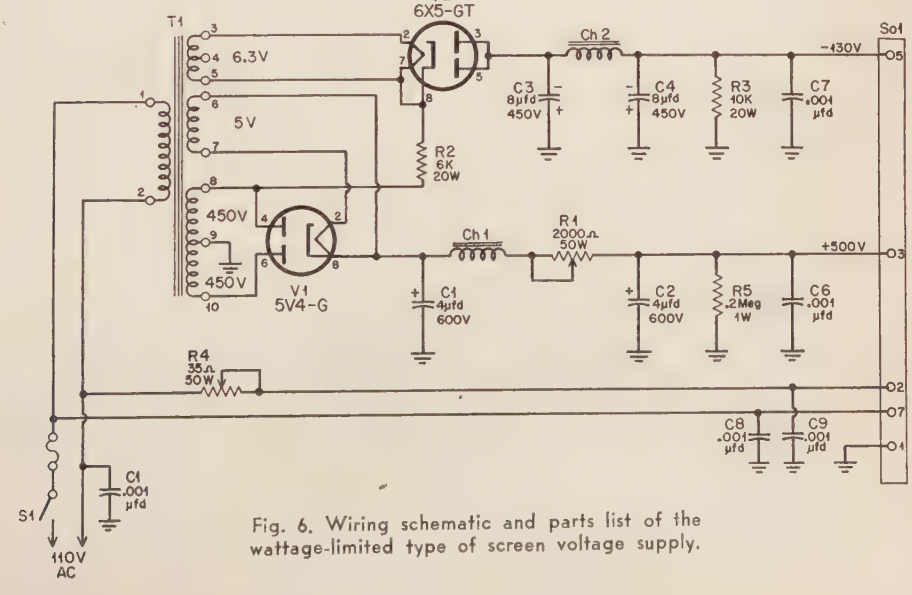


Fig. 6. Wiring schematic and parts list of the wattage-limited type of screen voltage supply.

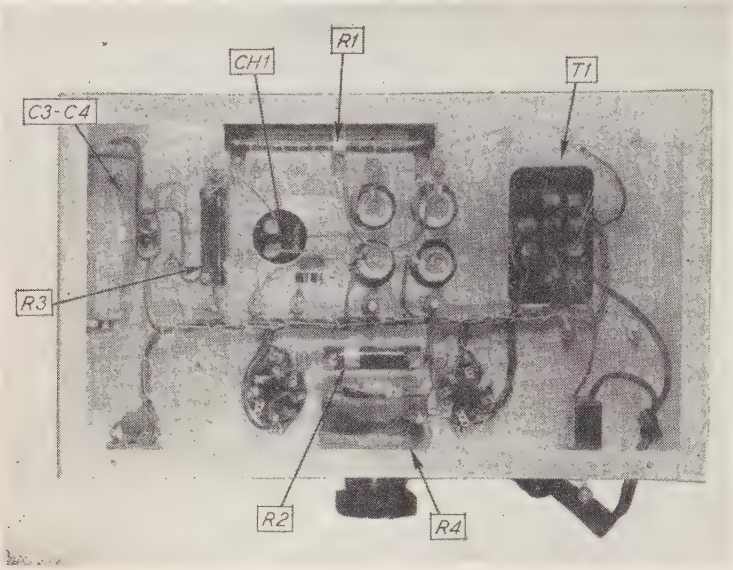


Fig. 8. Under chassis wiring view of the supply. Note particularly that C3/C4 is a dual unit with separate negative leads. This condenser is used in the bias supply and has the positive leads grounded.

vide the correct cut-off bias to appear across *R3*.

It is necessary that the bias voltage be applied to the 4-250A at the same time, or slightly before the screen voltage is applied. A 5V4-G cathode type rectifier is therefore used for the screen supply, making its warm-up time approximately equal to the 6X5 tube in the bias supply. Actually, the 6X5 warms up quite a bit faster than the 5V4-G, since the filament voltage on the 6X5 tube is about 6.8 volts. No harm is done to the 6X5 by this high filament voltage, as it is well within the 10% variation limit set by the manufacturer.

It is convenient to have the filament voltage of the 4-250A controlled by the same switch that controls the above voltages, so 110 volts is brought out through two prongs of the power plug to be applied to the filament transformer of the 4-250A. Rheostat *R4* is mounted on the supply to adjust the filament voltage to exactly 5.0 volts.

The wattage limiting resistor *R1* is a 50-watt type, with an adjustable slider.

Construction of the Supply

The supply is easily constructed upon a 12x7x3-inch aluminum chassis. The placement of parts is not critical. Good 600-volt oil condensers should be used for *C1*, and *C2*. *C3* and *C4* are the condensers for the bias supply, and may be a dual unit *with* separate negative leads. (Remember, positive leads grounded, negative leads to each side of *Ch2*!) Condensers *C6-C9* are to prevent r-f from wandering back into the supply. They are mounted directly on the pins of *Sol*. The wiring for the supply may be laced and run down the center of the unit as shown in the photograph.

Testing the Supply

When the supply is wired, it should be carefully checked before voltage is applied to it. Be sure of the correct polarity of *C3* and *C4*. Insert the 5V4-G and the 6X5 tubes in their sockets and turn on the primary switch. Plus 600 volts (without load) should be measured from *pin 3* to *pin 1* of *Sol*, and minus 130 volts from *pin 5* to *pin 1* of *Sol*. Adjustment of *R1* and *R2* will set these voltages correctly. For tubes other than 4-250A's, consult the chart in *Table I*. To plot the output wattage of the supply, various values of 50-watt resistors, ranging from 500 to 10,000 ohms should be placed across *pins 3* and *1* of *Sol*, and the voltage across, and current through these resistors measured. A chart such as shown in *Fig. 7* may be made up from these measurements. *R1* may then easily be set to limit the maximum wattage delivered by the supply.

Operation of the Supply

Operation of the supply is easy! Just hook it up and forget it. The correct voltages will come on an instant after the tetrode filament is warm. The tetrode is fully protected, and if

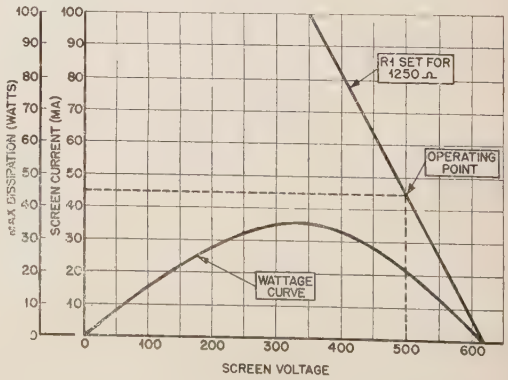


Fig. 7. Plot of voltage, current and wattage of the safety screen supply. All values are dependent on the setting of R1.

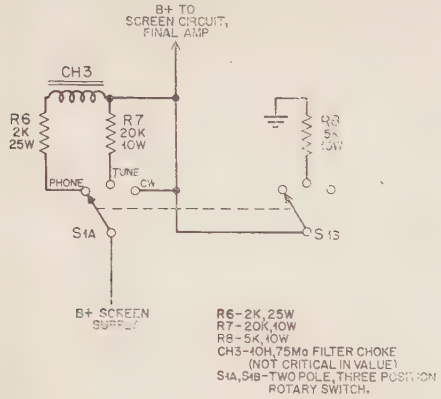


Fig. 9. To permit phone operation with the safety screen supply it is necessary to add a choke in the screen lead to the final amplifier tetrode. Provisions are made to switch it out of the circuit for C-W operation.

something happens to blow the fuse of the bias supply, the filaments of the tetrode go off, too. After it is installed, you can forget it is around!

Phone/CW Switching Circuit.

The safety screen supply may be used for phone operation by the incorporation of a selector switch, as shown in *Fig. 9*. An extra position on the switch will also permit a "tune-up" or QRP position, whereby the final stage may be run at reduced input for tuning, or cross-town QSO's.

In the "phone" position of *S1*, a series modulation choke, *Ch1* and dropping resistor *R1* are introduced in the screen circuit. *R1* drops the screen voltage by about 80 volts at a screen current of 40 ma. An additional 20 volts drop is introduced by the d-c resistance of *Ch1*, making the applied screen voltage 400 volts, which is the correct amount for 4-250A or 4-400A tubes. *R1* may be increased in resistance for those tubes requiring a lower value of screen voltage for modulated operation.

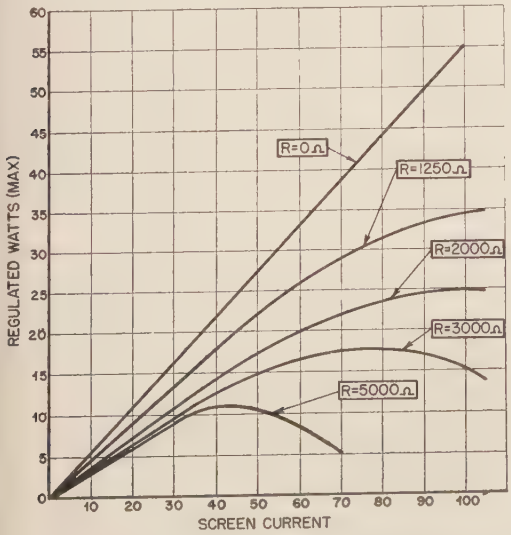


Fig. 10. Wattage ratings (approximate maxima) of the screen supply with various values of R1.

No audio power need be applied to the screen circuit. *Ch1* isolates the screen circuit from the filter and bypass condensers in the screen supply, and allows the screen of the pentode tube to "float" at an audio potential determined by the modulation level of the plate of the tube. This results in a very linear form of plate modulation, and requires no audio power to be supplied to the screen. The normal amount of audio power is coupled to the plate circuit of the pentode tube, as in any normal form of plate modulation.

When *S1* is turned to the center, or "tune" position, a series resistor *R2* is added to the screen circuit, and a shunt resistor *R3*, is placed from screen to ground. This drops the screen voltage to the region of about 80 volts. The final amplifier may be tuned, or low power run to the transmitter for local QSO's without danger of tube overload. Changes in the value of *R3* will vary the "tune" screen voltage.

For straight c-w operation, with full screen voltage, *S1* is thrown to the "CW" position, and full screen voltage is applied to the pentode tube.

Attention:

Hamfest Publicity Committees

The Editors of **CQ** must candidly report that the publication of Hamfest and convention notices has been pretty much of a catch-as-catch-can proposition throughout the past several years. Practically all notices that were received were set in type. However, space allocations during the "make-up" of the magazine often as not dictated that a large number of such notices would be dropped.

Frequently notices about Hamfests were received too late to be included in the proper issue. The length of the announcements varied over extremely wide limits while many were garbled in hopes, we assume, that the Editors would straighten them out and make them readable. The end result of the handling of the convention and Hamfest announcements was a feeling by many groups of being "slighted."

To apply a little practical psychology and to make these announcements somewhat more valuable we are bringing to the attention of Hamfest and Convention Publicity Committees that notices will only be published in 1954 in the "Classified Ads" section of **CQ**.

A special insertion rate has been prepared and is 25 words for $1.00 and 25 to 50 words for $2.00. No special discounts will be granted for fractional ads. All convention or Hamfest ads will appear under a special heading. Address your announcements to: Classified Ads, CQ Magazine, 67 West 44th Street, New York 36, N.Y.

Re "Versatile 70 Watts"

There is an errant connection in the power supply schematic on page 21 (December, 1953 issue). The junction of cathode (**pin 7** of the 6X4) and filament (**pin 4**) should not be there. **Pin 4** is connected to **I1** as shown, but not to **pin 7** or the resistor network **R27** and **R28**. We hope all of the readers caught this in wiring up the transmitter.

Spurious Emissions

CAPT. E. H. CONKLIN, USN, W3VQ

7200 Clarendon Road, Bethesda 14, Maryland.

If you are Sitting Down to Design Your Rig this is the Article to be Read before Working out the Oscillator Stage. A Well-Known Author Tells Us the Why of Spurious Beats and What Can be Done About Them on a Fundamental Basis

The vastly increased use of very-high and ultra-high frequencies in recent years has placed great emphasis upon the emission of clean signals. By this is meant the emission of the desired frequency without considerable power being expended in various spurious frequencies which are likely to interfere with other services.

Some studies have been made of the methods by which v-h-f and u-h-f power may be obtained from a string of multipliers, or similar devices usually required in order to obtain satisfactorily high stability of the output frequency, as contrasted with the generation of the output frequency without multiplier stages. In one such test, it was found that a transmitter with a multiplier of, let us say, 24 times, would produce not only the harmonics of the output frequency, but also to some extent *all* the harmonics of the original crystal or master oscillator frequency. Similarly, a companion receiver using a crystal-controlled oscillator would respond not only to the image frequencies, but also to other spurious frequencies resulting from the production of other than the desired crystal harmonic in the oscillator chain.

Figure 1 illustrates the type of output that might be produced by a multiplier string in a transmitter. Some of the predicted harmonics may fail to show up unless the measuring equipment is capable of measuring spurious emissions that are more than 120 db. down from the desired output frequency.

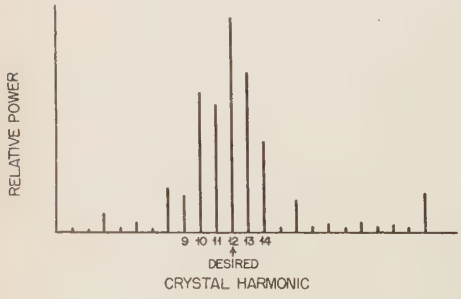


Fig. 1. Possible spurious emissions from a transmitter where the twelfth harmonic is the desired frequency. As explained in the text, these spurious emissions may result from coupling between the oscillator and the second or third multiplier stage rather than the stage directly following the oscillator.

Fig. 2. Spurious beats in a crystal controlled receiver. These are undesired products of the crystal multiplier and are exclusive of images.

Similarly, *Fig. 2* shows the type of response that might occur in a receiver using several stages of frequency multiplication in order to produce the first-detector injection voltage.

Harmonic Relationship

One of the first questions that arises in a study of the spurious emissions in a transmitter or spurious responses in a receiver, is in relation to the method by which the undesired frequencies are produced. Frankly, some of them may not be analyzed readily, but most of them can be related to some cause. For example, if we have a desired multiplication of 12, we might wonder how the 11th and 13th harmonics of the oscillator appear in the output when the numbers 11 and 13 cannot be factored, and therefore must be direct crystal harmonics without benefit of multiplication. The answer to this may lie in a study of *Fig. 1*, which shows that the amplitudes of many of the spurious emissions produced from the oscillator frequency are of irregular magnitude; that is, a crystal harmonic that should appear in the output may not be measurable, but, on the other hand, a harmonic that should not be strong may be excessive.

One may suspect, therefore, that the spurious frequencies are produced not only by the generation of harmonics of the oscillator itself, but also by leakage of the oscillator output into

other stages of the multiplier or into the final amplifier, where this power may modulate the frequency existing in that circuit. In short, the multiplication by 12 may produce output at the 11th and 13th harmonics simply by oscillator power getting into the final amplifier inductively or through circuit components, thereby producing the desired frequency plus or minus the modulating frequency. *(The output circuit of the first multiplier stage may be sufficiently "broad" so that the signal output of this stage is effectively amplitude modulated at the fundamental frequency. During subsequent frequency multiplication the "sideband" frequencies maintain their original separation from the carrier—Tech. Advisory Ed.)* The 10th and 14th harmonics may also be present due to this same leakage.

If such is the case, what are some of the factors that contribute to the creation of spurious frequencies in the output, and what are the methods by which these difficulties might be overcome?

What Can be Done about Them?

From the above discussion it is apparent that extensive shielding of stages, even to the point of filtering the power leads entering the shields, and the use of individual shield boxes with one-point grounds, may reduce unintentional modulation caused by electromagnetic or electrostatic coupling or by power being transmitted through leads or chassis. But even when this is done, spurious frequencies may still appear in the output, although the pattern may be changed.

Taking the most simple situation of an oscillator followed by a doubler and a final amplifier, the most probable spurious emissions are at the frequency of the oscillator, the harmonics of the amplifier, and the undesired third harmonic of the oscillator. Let us disregard the harmonics of the amplifier itself, as this problem has been treated adequately in the past. We may expect to reduce the direct coupling of the oscillator to the final amplifier and to the antenna by the shielding mentioned earlier, by neutralizing the doubler, by using a push-push circuit, by using adequate screening in the tubes themselves, and by using adequate selectivity in the tuned circuits following the doubler tube, which should discriminate to some extent against the oscillator frequency. Inasmuch as the oscillator frequency is considerably removed from the output frequency, this discrimination may be sufficient.

The third harmonic of the oscillator, however, will not be as far, percentage-wise, from the desired output frequency as is the fundamental of the oscillator; the third harmonic, therefore, may be transmitted through the tuned circuits at a somewhat stronger level than is the oscillator fundamental. Hence it is already apparent that good shielding, good filtering, and

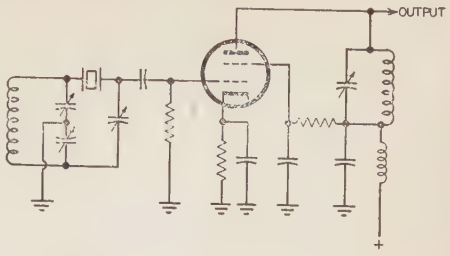


Fig. 3. Basic tri-tet oscillator circuit. This circuit will not create power at the crystal fundamental.

screening within tubes themselves may be required to control undesired spurious emissions. Also, tuned circuits should be selective and there should be an adequate number of them; or means such as tapping plates and grids down on the tuned circuits and inductive or link coupling should be employed to reject frequencies that differ from the output frequency.

Choosing the Multiplication Factor

Now let us apply this simple thinking to a long multiplier string. First, we should start with an oscillator that operates on the highest possible frequency, producing no power below that frequency.* Second, we should select a multiplier that can be factored into the lowest digits. That is, we certainly would not select 17 which can be factored only into 17 and 1, nor 19 which can be factored into 19 and 1. The most desirable multiplications would be 20, which can be factored into 2 x 2 x 5, or 18 which can be factored into 2 x 3 x 3, or, still better, 16 which can be factored into 2 x 2 x 2 X 2. The latter is preferable because only doubling is required, and tripling and higher factors are eliminated. That means that every stage in the multiplier string has the greatest possible separation between the driving frequency and the desired frequency, or between the next higher harmonic and the desired frequency. Obviously, it is not desirable to use a multiplier of 4 or any other figure which in itself can be factored into smaller numbers.

Separation of the desired harmonic of the oscillator from the desired adjacent harmonic, as mentioned above, is facilitated by the use of a higher frequency oscillator and a lower multiplication. This may not be accomplished too effectively by using a type of harmonic crystal that produces some power at the fundamental frequency. A very attractive approach to the problem of not creating any power at the crystal fundamental frequency is contained in a tri-tet oscillator circuit, with a crystal, inserted in the grid as a neutralized crystal filter. In this circuit, crystals in low capacity holders can be

(Continued on page 61)

* Some harmonic oscillators actually produce signals on the crystal frequency fundamental, although true "overtone" oscillators do not—**Tech. Advisory Ed.**

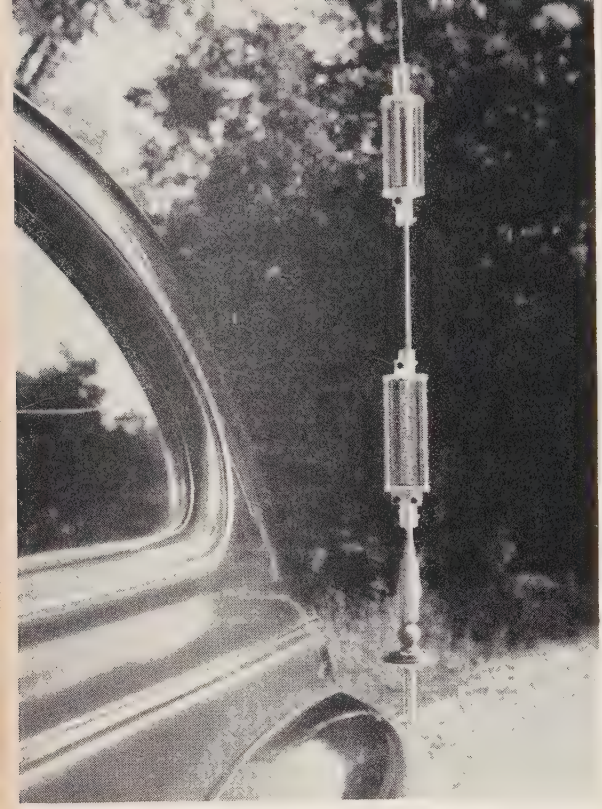


Fig. 1. The two high-Q loading coils shown here are important factors in the operation of this versatile antenna.

a Six Band Mobile Antenna

HARTLAND B. SMITH, W8VVD

467 Park Ave., Birmingham, Mich.

In This Article a Well Known Author Describes the Step by Step Construction of a Novel and Efficient Multi-Band Antenna

The number of amateur mobile installations which include band-switching transmitters has recently shown a marked increase. However, despite the ease with which gear of this type can be shifted from one frequency to another most mobileers still operate on only one band. This is true because the process of altering the resonant frequency of a loaded mobile antenna is usually so complicated that the average Ham shies away from the task.

After building a multi-band transmitter and installing it in my car I was faced with this same dilemma. I wanted to work several different bands, but I didn't care to load the trunk compartment with numerous coils and wrenches just so I could change the operating frequency of the antenna.

The most convenient way to have solved the problem would have been to construct an antenna with a remotely operated bandswitch controllable from the driver's seat. Unfortunately, most switching schemes that I could devise put too much metal near the loading coil and seriously reduced its Q. Although not remotely switched, the mobile antenna I finally settled for is relatively inexpensive to construct, works well on all Ham bands from 3.7 Mc. to 29.7 Mc. and can be changed from one frequency range to another with a minimum of inconvenience. It is truly a six-band mobile antenna.

The most efficient mounting position for a mobile antenna is reputed to be in the center of the car's roof. Trees, trolley wires and XYL's, however, make it impossible for the majority of amateurs to utilize such a location. Bumper mounting may be slightly less efficient, but it was decided on because it is certainly much more practical.

Total length, including loading coils, is slightly more than 8 feet. Although a longer antenna would work somewhat better on 75 meters, the 8-foot length was chosen as a good compromise between performance and appearance.

The Base Sections

As shown in *Fig. 2,* the lower part of the antenna is a 13″ length of ¾″ galvanized pipe which is fastened, by means of fiber insulators, to a bumper bracket of aluminum angle. A floor flange on the threaded top of this pipe provides a solid foundation for a body-mount style of antenna spring. Placing the spring

part way up the antenna results in greater mechanical stability, thus reducing antenna sway while the car is in motion. This is an important factor when two loading coils are made a part of the radiating system.

Threaded into the spring is the bottom 4½" of an Army surplus *AN-131-A* antenna. Although the lower portion of any mobile whip can be used at this point, the section of *AN-131-A* works out nicely because its fairly large diameter helps to provide good support for the rest of the antenna.

One end of a 12" length of 1" diameter polystyrene rod is drilled to a depth of 2" to accept the short piece of *AN-131-A*. A 14" section of ⅜" dural tubing is next cut and fitted into a hole drilled for it in the top end of the 12" poly rod. Another poly rod, 11" long, is drilled on the lower end to provide a tight fi with the dural tubing. The top 4 feet of a good spring steel mobile whip is then placed in a hole drilled at the top of the 11" poly rod. To insure that the sections of antenna are held firmly together, a number of *6-32* set screws are placed in holes drilled and tapped for them in the poly rods, as shown in *Fig. 5*.

The operating frequency of the antenna can be changed by shorting either *L1* or *L2* with a couple of 12" jumpers made from test lead wire. One jumper should have phone tips on both ends while the other jumper should have a phone tip on one end and an alligator clip on the opposite end. The jumper with two phone tips is for use with *L2*. The one with an alligator clip is for *L1*.

Fig. 2. A floor flange, atop a 13-inch length of ¾-inch galvanized pipe, provides a suitable location for the body mount type of antenna spring. A ¼-inch thick fiber disc acts as a shim between the spring mount and the flange to provide adequate clearance for the stud protruding from the bottom of the mount.

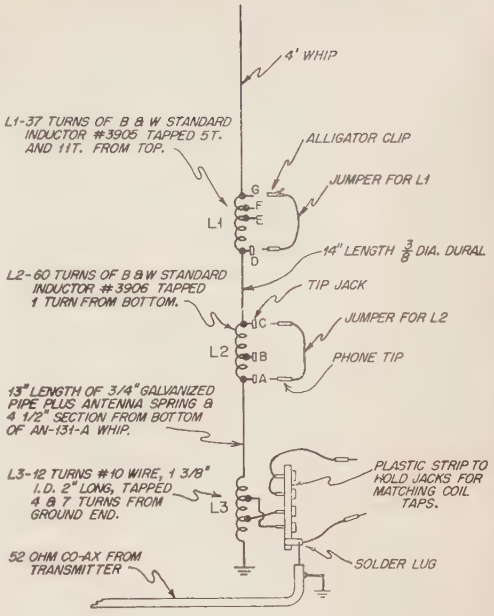


Fig. 3. Wiring schematic of the antenna.

Making the Coil Formers

Four 2 5/8" diameter discs with 1" center holes are cut from ¼" sheet polystyrene. The discs slip over the poly rods and help to hold the loading coils in place. Holes must be drilled in the discs for the screws that fasten the plastic mounts of the shorting jumper tip jacks. These mounts can be 4 pieces of ¼" polystyrene, ¾" by 1" in size. A hole just large enough to accommodate a tip jack should be drilled in each of these pieces. A smaller hole that can be tapped to take the *6-32* screw which fastens the mount to the plastic disc should be drilled in one edge of each mount. A drop of polystyrene cement put on this edge of the mount, just before it is screwed to the disc will provide a good strong bond between the two pieces of plastic. The tip jacks, by the way, should contain strong springs which firmly grip the tips of the shorting jumpers to provide good, low resistance contacts.

When working with polystyrene, patience is very important. Without it, Ole Man Friction will heat your tools to the point where the plastic melts into a sticky, unmanageable goo. A supply of water should be kept on hand for cooling drills and saws.

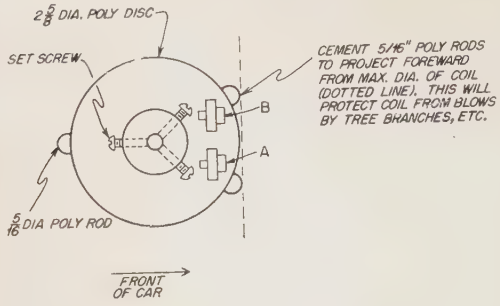


Fig. 5. This is a bottom view of L2 to show the positions of the rods to strengthen the coils.

The loading coils are modified B&W standard inductors. For preliminary tune-up purposes, be on the safe side and leave a few more turns on them than are shown in *Fig. 3*. The exact inductance required differs with each installation, and it is much easier to prune a coil that's too long than it is to add turns to a coil that's just a little too short.

Matching the Antenna

Matching the antenna to the coaxial feed line is accomplished by means of a small tapped coil, *L3*, connected between the base of the antenna and the car body ground. This coil can be closewound with 12 turns of #10 wire using a size *D* flashlight cell as a form. After the coil is wound, remove it from the battery and carefully stretch it to a length of 2". The coil may then be strengthened, as shown in *Fig. 4*, by cementing thin plastic strips to it.

The importance of this base matching coil can hardly be overemphasized. It answers the problem of incorrect loading which so often is encountered with pi-network finals operating on 40 and 75 meters. Furthermore, a matching coil makes possible the use of an inexpensive standing wave bridge to correctly resonate the antenna and produce a very low standing wave ratio on the feed line.

As can be seen in the photographs, the matching and loading coils are exposed to the weather. Normal precipitation has had little effect on the antenna and so no protective covering appears necessary for the inductance. It takes a very heavy downpour to put the unit so far out of resonance that it is no longer possible to load the transmitter on 75. Operation on the other bands is little affected by anything short of a deluge.

All exposed metal parts should be protected from the weather. The ¾" pipe and pipe flange can be given a coat of aluminum paint. The screws, and other pieces of hardware may be protected by spraying them with *Krylon*. The plating of these items isn't always too good and so the liquid plastic is used to help keep them from rusting.

Do not attempt to tune the antenna by guesswork. Either a standing wave bridge[1] or an Antennascope[2] must be employed during the process of adjustment if satisfactory performance is to be obtained.

Mount the antenna on the car with the loading coils temporarily held in position between the plastic discs by means of Scotch tape. The discs, in turn, should be taped to the plastic rods to keep them from slipping down during the preliminary tune-up. Once the antenna is working properly, the discs and coils may be permanently cemented in place. At the same time three 5/16" polystyrene rods should be cemented to each coil as shown in *Fig. 5* to provide a certain amount of mechanical protection. The rods can be so positioned that they will help to absorb any blow from a tree branch or other obstruction which may be encountered when the car is in motion.

One satisfactory method of antenna tune-up employs a standing wave bridge as shown in *Fig. 6*. With the antenna temporarily disconnected from the output of the bridge, feed in just enough r.f. to give a full scale reading on the indicator meter. If your mobile rig can't be decoupled sufficiently to prevent overloading the meter, some other source of low power

1. "Bridge Construction," p. 480, The Radio Amateur's Handbook, 30th edition, 1953.
2. Scherer, W. M.: "Building and Using The Antennascope," CQ, September, 1950.

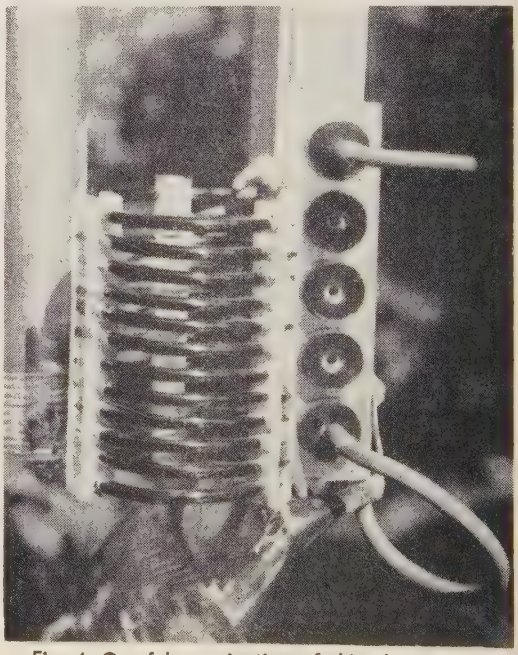
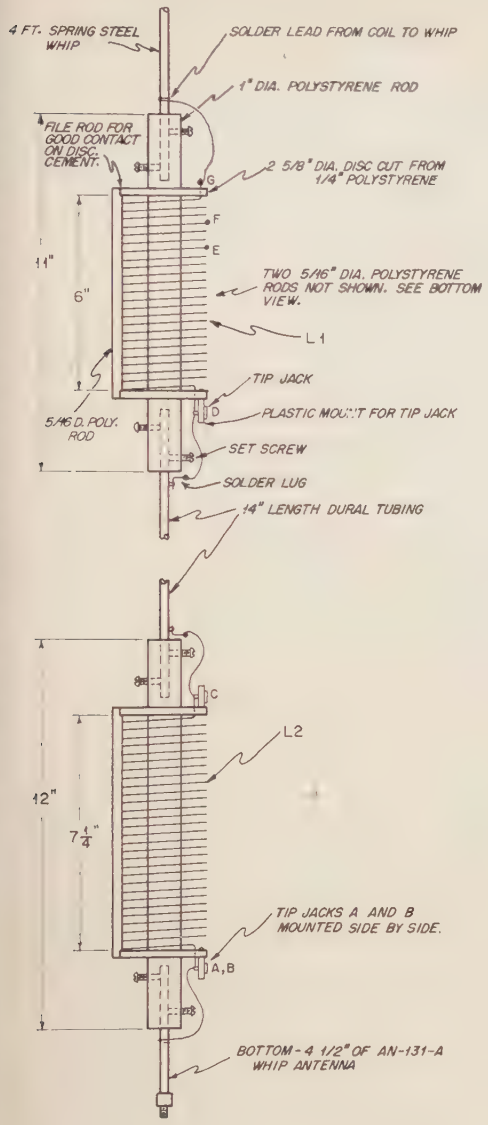


Fig. 4. Careful examination of this closeup will reveal that matching coil, L3, is mounted upside down. The top is grounded to the aluminum angle mounting bracket, while the bottom is connected to the base of the antenna. The center tip jack on the plastic strip to the right of L3 is not used, and so may be omitted by the constructor.



Mechanical assembly details of the antenna.

r.f. will have to be found. In my case, Command transmitters, a BC-458 for 75 and a BC-459 for 40 and 20, were pressed into service. When powered with a small a-c supply, the output from one of these rigs can be made very low by reducing the coupling to minimum and, at the same time, slightly detuning the final plate condenser.

Once the indicator reads full scale, the coaxial lead from the antenna may be attached to the output terminal of the bridge. The meter reading will drop, but it won't go to zero. Short the bottom loading coil, *L2*, and set the matching coil for 40 meters. Plug the jumper with an alligator clip into the jack in the base of the upper loading coil, *L1*. Using the jumper, start at the bottom of *L1* and short out a turn or two. Note the reading on the standing wave indicator and then short out a few more turns. After several trials, some point will be found where the reading on the meter will drop to zero. This denotes antenna resonance and a correct match between the feed point resistance of the antenna and the coaxial line. If no position can be found where the meter goes all the way to zero, move the 40-meter tap on the matching coil, *L3*, up or down a turn or two and repeat the shorting process on *L1*. When the meter finally reads zero, disconnect the alligator jumper and remove almost all turns which had to be shorted out on L1. Then, carefully prune the coil a turn at a time until the antenna is resonant at 7250 kc. as shown by a zero reading on the standing wave meter.

Tuning Up on 75 Meters

Disconnect the antenna and feed enough power at 3850 kc. to the bridge to produce a full scale reading. Reconnect the antenna and set matching coil, *L3*, for 75 meters. Leave *L1* unshorted, and plug the alligator clip jumper into the jack at the bottom of *L2*. Proceed to tap up on this coil until a resonant condition is noted. As with the 40-meter adjustment, it may be necessary to make a slight change in the position of the matching coil tap before exact resonance can be achieved.

If you wish to operate at a higher frequency in this band, you can tap up one or two turns from the bottom of *L2* and bring this tap out to another tip jack at the coil's base. By plugging a jumper between this tap and the bottom of *L2* the resonant frequency of the system will be raised a number of kilocycles. Another method for QSYing on 75 is to resonate the antenna near the high frequency end of the band. Then a short pigtail may be clipped to the whip where it emerges from the top of *L1*. The added capacity of the pigtail will lower the resonant frequency by a significant amount.

To tune the radiator for 20 meters, disconnect the antenna and feed r.f. to the bridge at

(Continued on page 62)

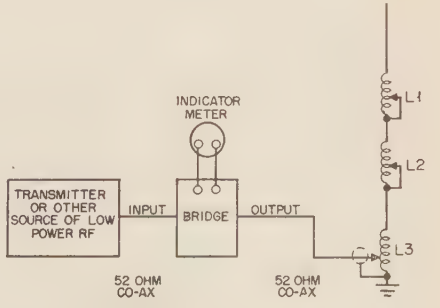


Fig. 6. Block diagram showing the connections to VSWR bridge during the tune-up process.

the Cool Persian

G. FRANKLIN MONTGOMERY, W3FQB

Now gather round, Kiddies, and Uncle George will come on with the story of Ali Baba and the forty TV's, or how square a picture can you get?

Once upon a time, in the land of EP, there lived a young cat named Ali Baba. Now Ali's old man was a TV service type, and one day while he and Ali were cleaning up the joint he said, "Kid, there's a real sharp chick over on East Rubaiyat who's been after me to fall by her pad and touch up her horizontal linearity, like, so I'll be cut out for a couple of sets."

"Wild," said Ali, "but what if Mrs. Khayyam rings up about her hi-fi again?"

"Tell her I'm gone," said Mr. Baba.

"Pops, she already knows you're real frantic," said Ali. "I mean, where shall I say you went?"

"Tell her I've goofed," said The Head, "I got no time to dig that old jazz," and modulated out the back way.

Now this was the time of day when Ali was feeling the least, so he decided to take five and pick up on the sounds on a new shortwave a customer had left. Trying to catch something hip, he moved across the 40-meter band in the middle of a CD session. "Man!" said Ali, "Dig that crazy flute," and right away began to hav eyes for Ham radio. In almost no time, Al had himself a big rig, a super super, and si in phase, rotary like.

One evening after the twenty-sixth call t CEØAA, one of Ali's neighbors fell in. "Look Jack," he said, "it's Tuesday, and me and th missus likes to catch Milton Bernoulian o Channel 4. Why don't you wrap up then electronics and get lost?"

"You're flipping," said Ali. "All I got here i a cool 807; you can't get TVI'd from that."

"Don't hand me that jive," said Red Eye "Besides, I ain't the only one; every cat fo

". . . me and the missus likes to catch Milton Bernoulian . . ."

blocks around this pad says you been comin on like Dragnet."

"Now look, Man," said Ali, "let's not get al steamed, like. What do you say we pick up on some juice and gas this thing over?"

"Crazy!" said the neighbor, "Fill me in," and after a couple of tastes he began to see the light. In fact, Ali phrased it so groovey that Old Rasters even put in for his card.

Before long the two of them had all the local squares hip to CW and making with the kilowatts, and the sounds from EP-land began riding out on 20 like Jazz At The Phil. But the most was, that when next November fell by, Ali and the boys made the club award in the Greater Near East Sweepstakes, which was really the end, you know?

"Now Ali's old man was a TV service type . . ."

Gathered by DICK SPENCELEY, KV4AA

Box 403 St. Thomas, Virgin Islands, U.S.A.

This month we are happy to report quite a number of new WAZ entries. Our heartiest congratulations to the following stations who now enter this "elite" category:

NO. 293	**SM5LL**	**Hilding Anderson**	**40-**
NO. 294	**SM5KP**	**Wiktor Persson**	**40-223**
NO. 292	**ZS2AT**	**A. Burney Trewin**	**40-171**
NO. 291	**G2M1**	**Arthur Milne**	**40-202**
NO. 295	**W8PQQ**	**Albert H. Hix**	**40-240**

We also welcome the following newcomers to the HONOR ROLL:

VE3LJ	**37-161**	
W6HJ	**35-104**	
SM5KP	**38-199**	**(Phone only)**

Cocos Island, TI9UXX (W6UXX)

The long awaited appearance of Evan, TI9UXX, materialized on November 14 between the hours of 0135 and 1202 GMT. As was expected, due to the necessary briefness of his stay, the time of day spent on the air coupled with the uncertainty of his actual arrival caused many of the DX gang to miss him by a wide margin. Only twenty-nine contacts were made. The lucky ones were as follows: W1WPO, W1YYM, W2BOK, W2DOD, W2ESO, W2FSN, W2GLM, W2HTT, W2UWD, W3VWH, W4IMI, W5QKZ, W5TLY, W6CGQ, W6CYI, W6DFY, W6KYG, W6LW, W6OEG, W6RW, W8BKP, W8NBK, W9ESQ, WØEWF, WØJCT, WØQDF, G2PL, HR1AA and KP4CC.

Here is a brief resume in Evan's own words: "On the evening of November 13 we anchored in Chatham Bay, Cocos. I was unable to get ashore until 0135 GMT on the 14th due to commercial radio schedules. Loading the tarpaulin-wrapped gear on a small skiff (it was raining cats and dogs, of course), I set off for shore, and, with the aid of the ship's searchlight, attempted to locate a sandy beach. Due to high tide this was unsuccessful but I managed to get ashore after a rough landing which thoroughly soaked my key in salt water. Pulling the skiff up as far as possible I tied a long line to the bow and secured it to a tree twenty yards away. Propping the line up with sticks I threw the tarpaulin over it and, with the help of another line, I had a makeshift tent which effectively dripped water inside very nicely. Next, the key had to be dismantled and the base wiring removed. A couple of battery clip leads to the contacts finally made it workable. Also, I had no means of anchoring the key, which made it necessary for me to answer calls on my own frequency so that I could monitor my transmissions for some degree of accuracy via the receiver.

"At 0446 GMT I called W6KYG on 14,122 kc. as planned, and followed this with a few CQ's with no results. Altho a few phone signals were heard on 20 the band seemed completely dead for CW. I then shifted to 7022 kc., tuning the transmitter to resonance by listening to the receiver, and, with tongue in cheek, called *CQ de TI9UXX* at 0529 GMT. The response was immediate and I logged the following: *TI9UXX de W3VWH your sigs 569 in Pittsburgh OM. The name here is Mort. If I sound nervous it's because this is my first 7 Mc. QSO with my new General Ticket* (This boy Mort is going far if his luck holds up!!). QSO No. 2 was with W9ESQ, No. 3 with W2DOD, No. 4 with W6RW and No. 5 with W6CYI. QRM on frequency was heavy but nothing could be done as the 7022 rock was the only one I had along which would perk on 7 Mc. My operating position was extremely cramped and my feet reposed in a puddle of water. Many QRT's were necessary to wipe things dry. Power was furnished by a 6-volt *Auto-Lite* storage battery which read 1.260 at the start and checked in at 1.215 after the operation. Illumination was furnished by a 6-volt 400-ma. pilot light.

"Came the dawn and I found the tide at low ebb. This forced me to portage the skiff over to a section of beach some seventy-five yards away. I still bear scars from this—!! The ship's motorboat was then sighted; the skipper had been getting worried about me, and I was towed back to the ship, thus ending this Cocos episode." (We understand that Evan will have other chances to repeat this safari so don't give up hope on that TI9 QSO.)

MACQUARIE ISLAND, VK1: The relief ship "Kista Dan" called at this QTH in December and picked up VK1AF, VK1BA and VK1RL for the homeward trip. At the same time it disembarked VK3ACI, Alan, who will be the only Ham here for 1954. His call is VK1CI.

HEARD ISLAND, ANTARCTICA, VK1: VK3ADZ and VK2PG are due to depart in January for Heard Island where they will be using the calls of VK1DY and VK1PG. Bill Storer, VK2EG, ex-VK1BS of

Macquarie, accompanies them and will be dropped at MacRobertson Land which is directly south of Heard Island on the Antarctic Continent. His call will be VK1EG.

CHRISTMAS ISLAND, ZC3: This QTH has been heard from via the signals of ZC3AB, 14080/14090 kc., 1130 GMT. His name is Dave Laing, ex-VK2DE. QSL's go via Malaya.

TIBET, AC4NC: Chak has been putting consistent signals through to the Caribbean area around 1130 GMT on 14120. He is usually on phone on this frequency but will switch to CW on request for greatly improved readability.

PERSIAN GULF AREA, MP4: Some new activity from Qatar comes from MP4BEN (Dukhan Airport), MP4BUS (QSL via QPC Persian Gulf), MP4QAB and MP4BTF. The last mentioned also operates mobile from Trucial Oman. We understand that MP4BAU, formerly in Qatar, now operates from Bahrein Is. MP4BEN and MP4BUS have been heard around 1330 GMT near 14070. DL4QX nabbed MP4QAH who gives his QTH as Halul Island (60 miles NE of Qatar but not under its jurisdiction), 14142 A3. MP4ABW continues phone activity from Qatar. WØECS reports a QSO with MP4BAU on 7039 at 2345 GMT.

ZC4XP/YP1, YP1AB: Many stations worked these two during the latter part of November. QTH was not given due to "security reasons." Light may be shed on this in our next issue.

CRETE, SV9: DL4QX (W6CUF) and SU1BJ plan a trip to SV9 some time in February. Exact date is not yet known so keep your ears open for this one.

ALDABRA ISLAND, SEYCHELLES ISLANDS, VQ7NZK/VQ9NZK: An expedition covering one, or both, of these spots should take place around the middle of February. Plans call for a twelve-day stay.

ALBANIA, ZA: SP3AN reports that a legitimate station signing ZA1KAA will shortly appear from this QTH.

GRENADA, WINDWARD ISLANDS, VP2RO: G2RO was scheduled to have been on for this spot from Jan. 1 to Jan. 12. Bob made some 300 QSO's as VP7RO and about 600 QSO's as VP1RO. Frequencies most used are 7030 and 14059. QSL's go to G2RO or via RSGB. Bob sails for England on Feb. 9 from Jamaica.

TRINIDAD ISLAND, PYØ: PY2CK advises that this expedition is shaping up and may occur in January. This QTH is some 900 miles off the east coast of Brazil.

BURMA, XZ2OM: This station advises that he is on each day from 1130 to 1230 GMT, 14022 kc., looking for DX QSO's. The name is Mike.

NORFOLK ISLAND, VK9: VK9GM has been active from this spot and may be found on 7010 or 14022. QSO's have been reported around 0530 GMT on the latter frequency. VK2AOK is also on the island and is active as VK9OK.

SHIP "XARIFA," DI9AA: This vessel passed through the Panama Canal on December 23 and now operates in the vicinity of Galapagos and Cocos Islands. Permission to land on Cocos has been requested from the TI government and there is a bare possibility that the op of DI9AA may be heard as TI9AA. This underwater photography expedition returns to Germany in March.

KERGUELEN ISLAND, FB8: Joe, ex-op at FB8ZZ, Amsterdam Is., will sail for Kerguelen in January and will put FB8XX back on the air. As Joe is a rabid DX'er we should all have a very good chance to add FB8XX to our lists.

LUXEMBOURG, LX1AS: OE1FF has been on, from LX1AS, every Saturday from 1300 to 1930 GMT, 14-Mc VFO. He is due to return to Vienna on February 1.

JAN MAYEN ISLAND, LB: LB8YB and LB6IE continue activity from this spot. 8YB may be found on 7020 at about 0200 GMT and on 14039 around 1400 GMT.

DX Notes

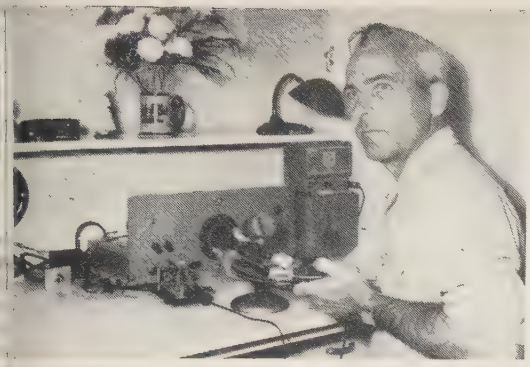
TI9BR has been QSO'ed on 7008 but says he is in Puntarenas, Costa Rica. He tells of one TI3FR who will be active on Cocos when gear arrives . . . **TI9BRA** was worked by W4ZAE but no definite dope . . . **VP2MD** is again active after a physical checkup in VP6 . . . In a letter to LU5AQ; Floyd McCoy, **VR6AC** says his receiver is up in Balboa . . . **ZC3AB** runs 40 watts to an 815 . . . **SVØWG**, Rhodes, was QSO'ed on 7010 at 0100 GMT. Roy says he will not go to Crete . . . **IT1AGA** is QRV for DX each day between 2300/2400 GMT on 3620 . . . **ZC5VS** is supposed to be on each day from 1045 to 1230 GMT, 14085 xtl . . . ZL2LB advises that VK9YY also handles QSL's for **JZØKF** . . . **ZC5** calls may be changed to **VS4** again . . . All LU-ZS calls emanate from the Argentine Antarctic base at Bahia, Antarctic continent, while **LU1ZT** is in the South Shetlands . . . **ST2UU** promises to cover ZD1 and ZD3 when conditions improve a bit. Jim recently picked up a new receiver and scrapped the S-40.

ZS8D was heard recently with Doc, ZS8MK, at the throttle . . . W6MUR picked up **C9AA** on 7020 . . . **HS1CA** has been heard on 14050, 1330 GMT . . . Very active at **VP4LZ** is new arrival, W4HKY. Other ops at VP4LZ, besides Ed, are John, W1EEC; Les, W6AKR, Butch and Carroll . . . **FR7ZA** was nabbed by **W5DJA** on 7010 at 2000 GMT . . . **AX8BA** turned out to be a Ham located in Alice Springs, Central Australia who awaits a new call . . . **FI8AE** has been very active 14080, 1200 GMT . . . Jim, **ST2UU**, writes W8JBI that he is thinking of filling up the Dakota with gas and heading for the Comoro Group, FB8. We can't think of a nicer place Jim!! . . . Jeff, **YI2AM**, wishes it known that he is looking for W's from 1400 GMT on. He is on 'phone around 14145.

Exploits

W8NBK, Arkie, went to 243 with EA9DD and TI9UXX . . . EA9DD also helped **W6SYG** to No. 241 . . . **Jayme PY2CK**, added VQ9UU, VU5AB (Car Nicobar), **JZØKF** and EA9DD to boost his total to 248 while phone contacts with EA9DD, ZC5VM and VU5AB put him way out ahead in the "Phone only" section with 225! . . . **Luis, CE3AG**, submits EA9DD and CEØAA to reach 234 . . . **W6DZZ** came up to date with some recent oldies such as FL8MY, VS5ELA, EA9DC and MP4KAE to rest on 229 . . . **DL1FF** upped to 224 with KJ6AX, ZC5VS, VS9UU, CEØAA and EA9DD . . . Horace, **W6TI**, pulled

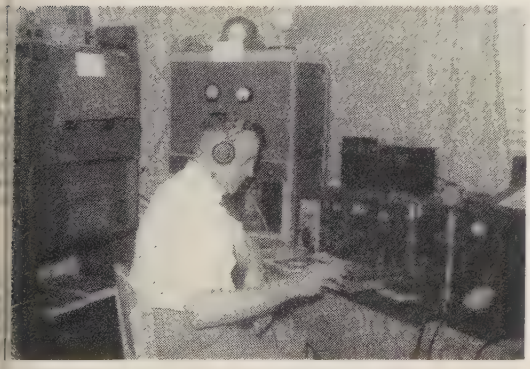
(Continued on page 72)



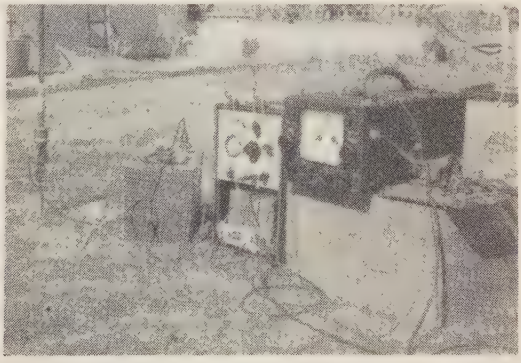
W6BAX, "Opie" Taylor, San Carlos, Calif. needs no introduction. Licensed in 1927 Opie was one of the top pre-war DX men. The rig, remotely controlled from this position in the kitchen, runs 800 watts to PP 4/125A's assisted by a three element rotary beam. W6BAX sticks to 14 Mc. and his present CW score is 222 countries. The homebrew receiver pictured above has since been replaced with a Collins 75A2. (Photo: North California DX Bulletin)

HR1AT, Oscar Trochez, of Tegucigalpa, Honduras is active on all bands Phone and CW. Set-up runs a Viking VFO-6L6-807 which pushes an 813 to 150 watts. Oscar, who is now acting as HR QSL Mgr. wants it known that he is on every day at the following times: 1900/2000 GMT on 21 Mc., 2000/2100 GMT on 14 Mc. and from 0400/0600 GMT on 7 or 3.5 Mc. HR1AT went on the air in 1947 and has worked 105 countries and about 2000 W's.

Thirty-four certificate holders attended the initial W9-DXCC get-together held in Chicago on December 5th. Standing (left to right) are W9FDX, W9TKV, W9PGW, W9DHT, W9ABB, W9TMU, W9FKC, W9ABA, W9YFV, W9ESQ, W9GRV, W9ALI, W9WFS, W9GIL, W9WKU, W9FID, W9KA and W9NN. Sitting (left to right) are W9IU, W9UM, W9VW, W9UJ, W9KXK, W9HQF, W9GZK and W9QIY. Present but not appearing in the photo were W9TQL, W9JUV, W9UXO, W9CIA, W9GDI, W9FNR, W9MXX and W9LI. The meeting was arranged by W9NN who was ably assisted by W9KA and W9PGW. (Chicago Tribune Photo)



VK4FJ, Roy Baxter, Brisbane, Australia is the man behind one of the most consistent signals from "down under." Roy runs 75 watts to PP807's on 28, 21 and 14 Mc. and 100 watts to an 813 on 7 Mc. The country total at VK4FJ is 207; AC4NC QSL is awaited for WAZ.



Equipment at TI9UXX: A Hallicrafters S29, a crystal controlled transmitter with a 2E26 final, Vibrapak-powered with a six-volt storage battery. Whip is rigged as groundplane, tuned to 14,100. Entire rig can be assembled or dismantled in five minutes.

W. A. Z. HONOR ROLL

WAZ

CW & PHONE	
W1FH	256
W3HGW	253
W6VFR	249
G6ZO	249
W3BES	248
W6ENV	248
PY2CK	246
W2BXA	244
G6RH	243
WØYXO	243
W6AM	243
W8NBK	242
W6SN	242
W3KT	241
W3GHD	241
W3EVW	241
W2AGW	241
W6SYG	240
W3JTC	240
W8PQQ	239
W3BHW	239
W3GAU	238
W8JIN	238
W6MX	237
W6GRL	236
W6ADP	236
W6MEK	235
W3CPV	235
W7AMX	234
LU6DJX	234
CE3AG	233
VE4RO	233
W6AMA	232
G4CP	230
W6GDJ	229
W7GUI	229
W6DZZ	228
W8BRA	228
ZL2GX	227
W6EBG	226
W6PFD	226
VK2ACX	225
W7DL	225
W6TS	224
W6SAI	224
DL1FF	223
VK3BZ	223
SM5KP	223
W3LGE	222
W6FSJ	222
W3BHV	222
W6MVQ	221
W6PB	221
G6QB	221
W6VE	221
W7BD	220
W6ITA	219
W6TI	219
W6TT	218
WØNUC	218
W6PQT	218
G2PL	218
KH6IJ	218
WØPNQ	217
W9DUY	217
W9NDA	216
W6DLY	216
W6CYI	216
W2PEO	215
W3JNN	215
W3IYE	214
PY1DM	214
ZS2X	214
KH6BA	214
ZL1BY	214
W6EFM	214
W6OEG	213
W4AIT	213
KH6CT	213
VK4HR	213
W6RBQ	213
CE3DZ	213
W6HX	212
VE7HC	212
OE1CD	212
G8IG	212
W6NNV	211
WØDU	211
W6BPD	210
W6MJB	210
W6IBD	210
W9VW	209
W6RW	209
W6UHA	209
W2AQW	208
ZL1HY	208
W6EPZ	208
W6SC	207
VE7VM	206
W4BPD	206
WØELA	206
W6ERI	205
W6ZCY	204
W6DI	204
WØPKO	204
VK2DI	204
W6AVM	204
DL7AA	204
W4CYU	203
W6HJT	203
W6RM	202
W6OMC	202
W6AOA	202
W6BUD	202
G2MI	202
W5GEL	201
W9KOK	200
VK5JS	200
W7OY	200
W6MHB	200
ON4QF	200
PY1GJ	199
W6RLN	198
W6SRF	198
W6UCX	198
W2IOP	197
KH6QH	197
W6BAX	197
G3DO	197
PY1AJ	196
W6WB	196
G2FSR	196
I1KN	196
W5KC	195
OK1FF	194
W6GAL	193
W6EHV	193
WØSQO	192
VK2NS	191
W6SRU	190
VK3JE	189
ON4JW	189
WØNTA	188
W8SDR	186
VK6RU	186
W6DFY	186
W4CYY	186
W6NTR	186
W2CZO	185
W1AB	185
W6IFW	185
W6SA	184
KH6VP	184
W2JVU	183
DL1IB	183
LA7Y	182
VK4EL	182
W6LN	181
W7ENW	181
W6SR	180
PY1BG	179
W9VND	178
W6NGA	178
WØUOX	177
VE6KW	177
W6UZX	177
CX1FY	176
I1XK	167
W6ATO	167
W6DUC	166
KH6MI	166
KH6CD	176
W6LDD	176
PK4DA	175
W8HUD	175
W6WKU	174
W6CIS	174
DL1AB	170
W6PZ	170
W5AFX	169
G2VD	169
W6JZP	168
W6ANN	167
W6TZD	173
G5YV	172
OK1LM	172
W6WWQ	172
PY1ARL	171
OK1HI	171
W6BVM	167
W6BAM	170
ZS2AT	171
W6JK	173
W7FZA	174
W6PCS	174
W6KUT	174
VK3CN	167
W6CEM	166
VE7GI	165
W6LRU	165
W6BZE	165
W6PM	164
ZS6A	164
W6EAK	165
W6YZU	163
G5GK	163
VE7VO	162
ZS6DW	162
I1IR	162
W6PDB	161
OK1SV	160
VE3EK	160
W6PUY	160
JA2KG	160
KH6MG	160
WØFFV	158
WØOUH	157
G3TK	157
W6BUY	157
W6QD	157
ZS6FN	157
W7BE	156
KH6IG	156
VK5KO	155
G3AAM	154
G2IO	154
OK1RW	153
W6RLQ	154
W6KEV	153
W6FHW	153
G3YF	152
KP6AA	152
W6ONZ	152
VK2QL	151
VK2AM	151
W6LEE	150
W6FHE	150
W6EYR	150
W6LER	150
W6NZ	148
OK1CX	147
W6LS	147
W7KWC	147
K6PY	147
W7DXZ	146
W6AYZ	146
VE6GD	146
VS6AE	146
W6ID	146
W9NRB	145
W6MUC	145
OK2SO	145
ON4TA	144
G3BI	144
W7LYL	143
KG6GD	143
W3IXN	141
W6AOD	140
VK2PV	140
ZC1CL	138
W6BIL	137
OK1WX	135
W7BTH	135
G3AZ	133
W6TEU	133
W6RDR	133
W6AUT	133
VE7KC	133
W6OBD	131
ZS2CR	131
CR9AH	131
W6IDZ	130
W7ASG	129
W7GBW	127
G8IP	127
G5BJ	126
VK6SA	126
PK6HA	124
G5VU	124
W6NRQ	123
W6MLY	123
ZL1GX	122
VK5MF	121
W6BUO	121
ZL2CU	120
ZS2EC	116
ZS6CT	113
W7KWA	98
W6DUB	89
W7IYA	59

39 ZONES

W5ASG	238
W8KIA	237
F8BS	232
KV4AA	232
W2NSZ	232
W2WZ	231
W9RBI	230
W3DPA	230
4X4RE	226
W1ENE	225
W3OCU	224
W3EPV	223
W2QHH	222
W1JYH	219
W1IHX	218
W9LNM	217
W5MPG	214
W1GKK	211
W4GG	211
W9FKC	211
W3DKT	210
W1BIH	209
W5LVD	209
W8SYC	209
W2HIF	208
W8HFE	207
VK4FJ	207
VE3QD	206
KP4KD	206
W2BJ	205
F9BO	204
W1ZL	204
W9IU	201
W2HZY	200
W3JKO	200
W5FFW	200
W2EMW	198
W9MXX	197
W7PGS	197
W9HUZ	197
SM5WI	196
W3KDP	196
W6LW	196
W4RBQ	193
W2CWE	192
W4LVV	192
VE3AAZ	192
W2IMU	192
W2AGO	191
W1AWX	191
OK1VW	190
GM3CSM	190
OE3CC	189
WØEYR	186
VE3IJ	186
W6GPB	186
W8RDZ	184
W9TQL	184
W3DRD	183
W4INL	183
W2MEL	183
W1DQM	181
W2CNT	181
W2RDK	180
W4AZK	180
VQ6EP	179
VK4DO	179
VE8AW	178
W9ABA	176
W8CVU	172
W4DKA	172
W2RGV	171
W4VE	171
W9LM	170
KL7PI	170
W6CTL	169
W1NMP	169
W3JTK	169
OZ7EU	169
HC2OT	169
PY2AC	168
W2CYS	167
W8LEC	166
W6WO	166
SM7MS	164
W4BRB	162
W8VLK	160
W4OM	158
SM7QY	158
W6KYV	158
W6LGD	158
WØAIW	157
I1AY	157
W8WWU	157
WØRBA	157
W9NZZ	157
DL1AT	156
W9YNB	155
DL1FK	155
I1AIV	154
DL1KB	154
W6CUL	154
G3AKU	150
VE7VC	150
G6QX	150
W1ZD	150
W2GUR	146
OK1AB	144
TF3EA	142
VS7NX	140
W6MUF	136
W6KYT	135
W7HXG	134
W7ETK	132
W6TE	131
W6WJX	131
W9ALI	131
W5CPI	130
KL7UM	129
DL1DA	127
W6EYC	126
VR5PL	124
DL3DU	118
W6NRZ	117
W6JWL	114
W6FBC	114
W6VAT	110
DL3AB	107
W7GXA	105
W6LEV	103
W6FXL	93
W7LEE	91

38 ZONES

TI2TG	215
W2HMJ	206
GM3EST	204
W1HA	198
CM2SW	183
WØTKX	181
W2PUD	181
W5KUJ	181
W2SHZ	180
W2GVZ	177
W8KPL	173
W8FJN	173
W8EYE	172
W3FYS	172
W1BFT	166
GM2UU	165
VE2BV	163
I1UV	160
ZL3CC	159
W3LVJ	157
W2UEI	156
LU7CD	155
W4LQN	152
W5MET	150
TF3SF	145
W6ETJ	144
W8ZMC	143
WØAZT	143
ZL3AB	143
W9FKH	135
MP4BAD	135
W4FPK	131
W2PQJ	130
W3ZN	129
EA1AB	129
W9MZP	126
FE8AB	126
W9TB	122
GW4CX	120
WØFET	118
KL7PJ	117
W6CAE	113
W7EYS	107
VK6DX	103
C1CH	84

37 ZONES

W6KYG	200
KP4CC	193
W1KFV	177
OZ7BG	171
W2OST	169
W3WU	162
VE3LJ	161
W2ZA	160
IS1AHK	160
W2WC	158
F9AH	157
W9LI	151
W4EPA	151
W4IWO	149
OE1FF	145
W6YK	144
W9WCE	142
W4ML	140
ZL1QW	138
W1APA	136
W2AYJ	133
W7HKT	130
W4DIA	129
VE5JV	126
W9LNH	122
OH3OE	118
W6YX	117
VE1EA	116
G3BPP	112
W6AX	110
WØFFW	108
W7PK	104
W8HSW	104
W2BLS	99
W6WWW	99
KL7KV	88

36 ZONES

W5JUF	206
W4HA	172
GM2DBX	165
W2ZVS	160
W3AXT	151
W3MZE	150
I1IT	140
WØCU	139
F9RS	139
W3AYS	137
OA4AK	128
VE1PQ	128
I1IZ	128
F8TM	124
W2BF	115
4X4BX	112
W5CD	108
W2JA	102

35 ZONES

KG4AF	182
W5FXN	162
W1DEP	159
W1RAN	147
W4DHZ	132
W9CKP	132
W6ZZ	132
W1MRP	13
W5AWT	12
OE5YL	12
ZL3CP	12
W9RQM	11
CO6AJ	11
WØGBJ	11
W9GDA	11
W9FNR	11
W8AVB	11
W2HAZ	11
I1ER	11
KZ5IP	10
W6HJ	10
KL7CZ	8

PHONE ONLY
39 ZONES

PY2CK	25
VQ4ERR	22
XE1AC	21
W3LTU	20
W6DI	20
G8IG	18
W6VFR	17
PK4DA	17
W7HTS	16
W8HUD	16
F9BO	15
VE7ZM	14
DL1FK	12

38 ZONES

W9RBI	20
W2BXA	20
SM5KP	19
W9NDA	17
W6AM	16
W6KQY	16
W4CYU	16
ZL1HY	15
W1HKK	13

37 ZONES

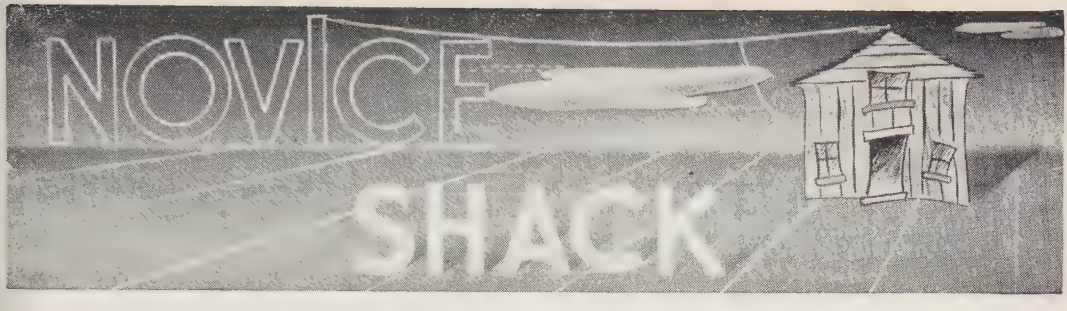
W3BES	19
W1JCX	18
CE3AB	18
W8REU	17
VK3BZ	17
W3GHD	17
G3DO	17
W7MBX	16
W9HB	16
W6PXH	15
GM2UU	15
W6WNH	15
W3JNN	15
W8BF	14
W6TT	14
F8VC	12
W7MBW	11
C1CH	8

36 ZONES

W1MCW	20
W1NWO	20
T12TG	17
ZS6Q	17
W1BEQ	16
GM2DBX	16
W4ESP	15
W2DYR	14
W9BZB	13
W9HP	13
W8AUP	13
W8PDB	13
VE3BNQ	10
W4INL	10
W1FJN	10
G6BW	10
VE7HC	10
WØHX	10
W8CYL	10
W3DHM	9
W6SA	9
F8DC	8

35 ZONES

HC2JR	17
W5JUF	17
W5ASG	17
W4HA	16
W5EVW	16
W9RNX	15
WØNCG	15
W6PCK	14
W9BVX	14
WØANF	14
PY2JU	14
W2GHV	13
W2RGV	13
W6CHV	13
WØPUE	13
HC2OT	13
WØEYR	13
WØPRZ	12
W9CKP	12
G8QX	12
W8ZMC	12
W6YX	11



Conducted by HERB BRIER, W9EGQ

385 Johnson St., Gary 3, Indiana

One way to increase your enjoyment of amateur radio is to join a radio club. This applies equally to the prospective amateur, the newest Novice and the old timer. Here are a few of the advantages of club membership.

For the prospective amateur, joining a club offers the opportunity to obtain help and encouragement in obtaining a license. Some clubs offer beginner's code and theory classes regularly. In others, individual members take beginners under their wings for private help. At the very least, a couple of beginners may be brought together through the club so that they can help each other.

For newly licensed amateurs the club is a wonderful place to boast about DX contacts and show off the QSL cards to prove them, get tips on how to de-bug their transmitters and to improve their operating techniques. It is also a good place to round up a crew for erecting a new antenna.

For all amateurs the radio club offers an incomparable opportunity to meet and renew acquaintance with local amateurs. This can be very important, because of the many different branches there are to modern amateur radio.

On the air, a CW station seldom works a phone station. Traffic men keep busy with schedules and nets. Single sideband (SSB) stations work other SSB stations. VHF/UHF stations seldom listen below 50 Mc. and so forth. As a result, the users of the different modes of communication have no opportunity to talk to each other over the air. At the club, however, these barriers are removed. Friendly chats and a little inter-denominational missionary work help us all to increase our knowledge of the pleasures and problems of these different phases of amateur radio. This strengthens our fraternal bond.

The radio club is also the ideal place to discuss such things as new FCC proposals, frequency allocations, and political developments that may affect our present enjoyment and the future existence of our hobby. They can be explored thoroughly, voted on, if necessary, and the result of the voting dispatched to the proper people as the majority opinion of the club members. In this manner, most of the misunderstandings and hard feelings and all of the bad publicity engendered by discussing controversial subjects over the air is avoided.

Organizing A Radio Club

What do you do if there is no radio club in your area? You organize one—Yes, you! With help, of course, because no one can start a club alone. Actually, there is nothing difficult about the organization. It is maintaining it that requires the effort, which is largely supplied by the few.

In general, there are two types of radio clubs. One is the purely social, informal club in which the members meet at each other's homes, with the host providing entertainment and refreshment at his discretion. The other is more formal, with a constitution, elected officials and probably a regular meeting place. In addition, it may have some special aim which it sponsors, such as the recruiting and training of new amateurs, participation in contests, or the construction of emergency communications equipment.

The informal club is easy to organize and is usually quite successful when membership is small. Its snugness makes it a very friendly affair. However, it may easily become a "closed corporation." If no effort is made to recruit new members when the original ones drop out or move away, the club just fades away. The formal club requires more effort to organize, but is more likely to be a permanent institution. Formality is almost a necessity when actual or potential membership is large.

The first step in organizing a club is to canvass for new members among all your radio-minded friends and acquaintances and among others they suggest. Practically all of them will be interested in joining a club, but not in organizing it. Keep talking until you have found one or two who will help. You now have an organizing committee.

The committee learns all it can about clubs by visiting others and asking questions. How did they get started? What are their biggest problems? Their most popular activities? Where and how often do they meet? What do their constitution and by-laws cover? It is better to get this information from other radio clubs, but organizational problems run pretty much the same in all hobby clubs, therefore officials of the local photography or stamp collector's club can give you valuable tips.

After the committee has some idea of the problems involved, an organizational meeting can be called. Notify by postal card, telephone, or in person everybody who might be interested, and try to get a small item about the meeting and its purpose published in your local newspaper—which is not nearly as difficult as some people imagine.

At the meeting, such things as the desirability of a club, its aims and purposes are first discussed. Then details—constitution, name, frequency of meetings, officials and their duties, and so forth, are discussed, and temporary officers appointed. Nothing permanent need be decided at this meeting. It is more important that everyone get acquainted and briefed about what must be done. Appoint committees to prepare a constitution, investigate possible meeting places, and select a suitable name. They will report to the next meeting, and their findings will be voted on.

Before the meeting adjourns, the temporary secretary should take the names and addresses of every-

one present, plus the names that they may suggest, in order to notify them, by card, of the date of the next meeting. Undoubtedly the committee members will have more information on the points discussed than anyone else present. In fact, the more pertinent information they can furnish the better, but they should not try to dictate their ideas as club policy. A club is a voluntarily cooperative organization, and its members decide for themselves how it is to be conducted.

The Club Constitution

An important part of any club is its constitution. It states the Club's aim and purpose, records its name, describes the duties of its officers, and covers similar matters. The bylaws then prescribe practical rules for the actual functioning of the club. A sample constitution and a set of bylaws were printed in **CQ** for October, 1948.[1] A point worth considering while organizing a club and writing its constitution is the advisability of incorporating it as a non-profit organization for the protection of its members. This is most desirable when group activities are sponsored, which might lead to a law suit against the club in the event of an accident. Incorporation, to be done right, usually requires the services of a lawyer, who can also explain its advantages and disadvantages; therefore, try to include one in your membership. It cuts cost.

Keeping The Club Going

Once the club is organized there will appear the problem of maintaining it. This, most of all, requires making the meetings interesting enough to make the members want to attend. A few suggestions, therefore, based upon the experiences of different radio clubs, may be helpful.

Oddly enough, holding member interest is easier if meetings are not too frequent. Once a month is usual. More frequent ones keep the program committee hopping to provide suitable entertainment. Suitable entertainment programs include demonstrations of new equipment by club members, dealers, or manufacturer's representatives. Descriptions by members of their experiences in building or using equipment featured in articles in **CQ** and other magazines may also prove entertaining.

Representatives of local broadcast and TV stations can give very interesting talks about their problems and amusing experiences. They can also often arrange for the club to make a tour of their stations. The larger companies, like **General Electric** and **Bell Telephone**, have films on electronic subjects which they will lend to clubs for showing. Your local library probably has a list of many of them, and the secretary of another nearby club can probably suggest other sources. An exchange of speakers between clubs is another possibility.

Club members also appreciate an occasional meeting without any formal program. It gives them an opportunity to visit and become better acquainted with each other.

Serving of light refreshments—coffee and doughnuts, etc.—is another important ingredient of successful meetings. It's not a necessity, but it does seem to produce a more relaxed friendliness among those attending.

Avoid those lengthy business meetings which make a Russian Peace Conference seem short. The average club member is not interested in them. It is expedient to have an executive committee of some kind to take care of routine business.

A final suggestion is to have the secretary mail a reminder to the members a few days before each meeting. It is surprising how many fellows miss meetings through sheer forgetfulness.

Club Members

The one important qualification for membership in a radio club is interest in radio. Practically, however, age also has some importance. Very young members frequently become bored at adult club meetings, and relieve their boredom by various forms of horseplay, thereby distracting the other members. As a result, some clubs specify that, to be eligible for membership, an applicant must either have a valid amateur license or be at least sixteen years old. Younger applicants are given private help by individual members until they obtain a license.

An even better solution is a special teen-age club. Any adult with the time and inclination can earn the eternal gratitude of the members by sponsoring one.[2]

1 "Radio Clubs: Making 'Em Work," H. S. Brier, W9EGQ, CQ, October, 1948, p. 32.

2 "How To Organize A Novice Club," Harold E. Pederson, W6MRP. CQ, August, 1951, p. 14.

Letters And General News

Gary, **WNØQDP**, Winona, Minn., reports for him and Bill, **WNØQDR**. "Dear Herb, Bill and I took exams the same day and got our licenses nine w later on the same day. In three months of operat Bill has worked 36 states and I have 32, plus VE3, VE5. . . . We both have **S-38B** receivers and 10-w home-made transmitters. Also, we trade between t 70-watt, 807 transmitter lent to us by ex-Novice WØH Our antennas are various sizes and shapes, but my r one is centerfed, 3.7-Mc doublet, and Bill's is a 7 end-fed ½-wave. . . . I am 16 and Bill is 17, and we both proud of our **'Minnesota Milliwatts'**."

"Salt," **KN2DEG**, writes, "Dear Herb, I write this ter while listening to the QRM (interference). We five Hams on our street, myself—KN2DEG, K2D W2QSV, W2NEP, and K2BVE. If that is not eno K2BWM and K2WLK are a block away! 73 from Ha Paradise, Montclair, N. J."

Del, **W8KJP**, reports that, since getting his "Gener he has worked 43 states, 6 Canadian provinces, Pu Rico, Venezuela, and Labrador on 80 meters. In a tion, he is a member of 5 traffic nets. He adds as a p script, "I am 15 years old. We live in a trailer, have to do all my operating standing up. 73"

Nick, **WN7TSM**, 1102 West Broadway, Lewistc Mont., writes, "Dear Herb, I am 15 years old, and I especially interested in working W8 and W9 on 7 I also operate on 3.7 Mc. My frequencies are 7,194 3,744 kc. . . . I will be glad to help anyone obtain t Novice license."

Nick, **KN4APN**, who was having trouble last mo has a better report this time. He writes, "Dear H Thanks for your letter. I really worked checking the transmitter (6AG7-807) and the antenna, and w I got it all tuned up, I called CQ. It was a noisy ni with a lot of WN's QRM'ing each other. But at l three stations answered my call! So now I am in h ness after four months of trying. . . . I sure hope I can help out some new Ham so that he won't ge disgusted as I did. Thanks again."

Marty, **W3QXV**, writes, "Dear Herb, Our West Cath High School Radio Club, 49th and Chestnut Str Philadelphia, has been reactivated again this year is going along in great style. Under the leadershi Andy, W3TPC, we have 12 Novices with their shiny licenses this year. Three of last year's Novices their Technician licenses and one has his General. The club has acquired its own call, W3WWS, and gang here would like to work other high school stations. We operate on 3711 kc. every school day a 2:30 p.m."

Mike, **WN9ASK**, 513 Forest Ave., River Forest, writes "Dear Herb, I use a 6AG7—6L6 rig, with watts input, a 7-Mc. dipole, and an S-38C receiver. far, I have worked 14 states and Canada on 3.7 7 Mc. All my reports have been good, and the rece works well with only a 20-foot antenna. . . . If any needs an Illinois contact or card, I shall be glad to m a sked with them. Or I am always ready just to c . . . I am 15 years old."

Ed, **WN1ZHE**, Boston St., Middleton, Mass., wr "Dear Herb, I would like to hear from anybody would like to organize a radio club for **boys** (and gi up to sixteen years old in or around Middleton, M There are several Hams around town who would lik have a radio club. My transmitter uses a 6L6 with watts input, feeding a 136-foot doublet, and my rece is an S-40B. I have worked about 100 stations in states. I sent cards to all stations worked and h received cards in return from half of them. I am years old."

John, **WN8ODQ**, Newton, Ohio, writes, "Dear Her have separate ½-wave doublets for 3.7, 7, and 21 and a 12-element, 146-Mc. beam. I have 12 states firmed out of 14 worked in 360 contacts. I have complaints about conditions, but I would like to see m activity on 146 Mc."

Donn Kuse, now an "expectant" Novice, says, "I Herb, Thanks for printing my letter about the S Correspondence Club in the November column. We ready have nine members (in November). I'd still to hear from other SWL'ers who need help in obt ing their licenses. Several of the members have he me a great deal. My address is: Donn Kuse, 1 Brecksville Road, Brecksville, Ohio."

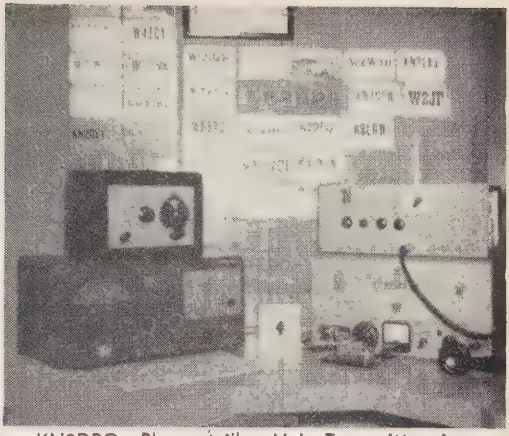
Help, Help!

Our list of those requesting help in obtaining an a teur license contains the following names:

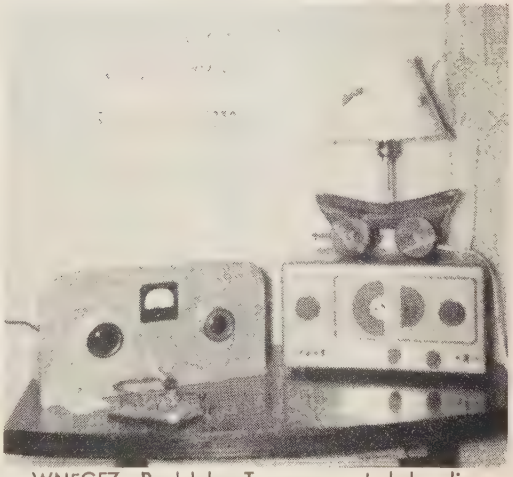
Jim Hollister (18), 661 Lottie, Monterey, Calif.

(Continued on page 70)

The answer to many Novice prayers! Yvonne Heath (16), WN8PBW, Dowagiac, Mich. She is to be found almost every afternoon on her favorite frequency, 3735 kc. Transmitter runs sixty watts to a 6146. Yvonne had a 10-w.p.m. code certificate before her license arrived.

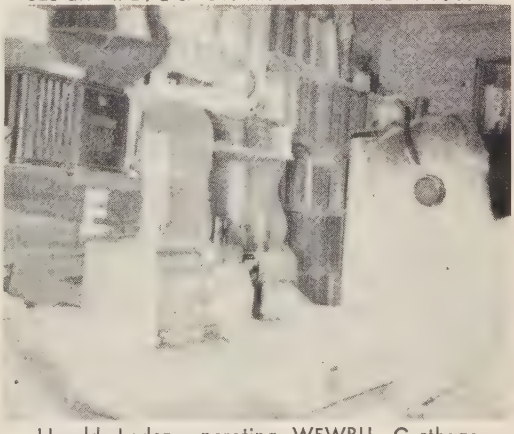


KN2DPQ, Pleasantville, N.J. Transmitter is a TR75 and receiver is an S-40A. Unit on top of receiver is a 146-Mc converter. The one on top of the transmitter is a converted BC-625 (522) transmitter for 146 Mc.



WN5CFZ, Rockdale, Texas, operated by Jim Rogers. The transmitter on the left consists of a 6L6 driven by a 6AG7. The receiver is an S-38C.

John Bowen, WN8ODQ, Newton, Ohio, owns this "all Band" Novice station and 146-Mc rotary beam. The beam tower is fifteen feet high and is mounted on the roof of the house.



Harold Loden operating W5WBU, Carthage, Texas. Running ten watts input, he made 1192 contacts in forty states as a Novice. Harold is the son of a Methodist minister and is a senior in high school.

ALL TIMES IN E S T

EASTERN USA TO:	15 Meters	20 Meters	40 Meters	80 Meters
Western Europe	0900-1300 (1)	0730-1300 (3-4) 1300-1500 (1-2)	1600-2000 (3-4) 2000-0600 (2)	1730-0400 (3-4)
Central Europe & Balkans	0830-1230 (1)	0700-1300 (3-4) 1300-1500 (2)	1600-2100 (3) 2100-0430 (2)	1730-0300 (3)
Southern Europe & North Africa	0800-1430 (1-2)	0700-1400 (4) 1400-1600 (2)	1600-2100 (3-4) 2100-0430 (3)	1730-0400 (3-4)
Near & Middle East	0830-1200 (1)	0700-1100 (1-2) 1100-1400 (2-3)	1700-2100 (2-3) 2100-2300 (1-2)	1900-2300 (1-2)
Central & South Africa	1100-1430 (1)* 0700-1030 (2) 1030-1430 (3)	0630-1230 (1-2) 1230-1730 (3-4)	1700-0030 (2-3)	1900-2330 (2)
South America	0930-1500 (1)* 0800-1500 (2-3) 1500-1700 (3-4)	0700-1600 (2) 1600-1900 (3-4) 0100-0300 (1-2)	1800-0400 (3-4) 0400-0700 (2-3)	1900-0500 (2-3)
South East Asia	Nil	Nil	0330-0800 (0-1)	Nil
Australasia	1600-1800 (1)	0700-1030 (2-3) 1030-2000 (0-1)	2300-0100 (2) 0100-0600 (1) 0600-0830 (2-3)	0200-0730 (2-3)
Guam & Pacific	1600-1800 (0-1)	1600-1900 (1) 0730-1030 (1)	2300-0830 (3)	0000-0700 (2-3)
Japan & Far East	Nil	1600-1900 (1-2)	0200-0830 (1)	0330-0700 (0-1)
West Coast USA	1300-1700 (0-1)	1100-1600 (3) 1600-1900 (4)	0800-1000 (3) 1900-2200 (3-4) 2200-0800 (1-2)	2000-0700 (3-4)

ALL TIMES IN C S T

CENTRAL USA TO:	15 Meters	20 Meters	40 Meters	80 Meters
Western & Central Europe	0830-1230 (0-1)	0700-1230 (3) 1230-1400 (1-2)	1600-1800 (3) 1800-0330 (1)	1800-0200 (2-3)
Southern Europe & North Africa	0900-1300 (1)	0600-1330 (3-4) 1330-1500 (1-2)	1600-1900 (3) 1900-0400 (1-2)	1730-0300 (2-3)
Central & South Africa	1100-1400 (1)* 0700-1100 (2) 1100-1400 (3)	0600-1200 (1-2) 1200-1700 (3-4)	1630-0000 (2-3)	1900-2300 (2)
Central America & Northern South America	1000-1400 (1)* 0800-1530 (4) 1530-1700 (1-2)	0630-0900 (3-4) 0900-1430 (2-3) 1430-1900 (4) 0000-0300 (1-2)	1700-0700 (4)	1800-0500 (3)
South America	0900-1500 (1)* 0700-1500 (3) 1500-1700 (4)	0600-0800 (3) 0800-1500 (2) 1500-1900 (4) 2300-0300 (1-2)	1730-0600 (3-4)	1900-0500 (2-3)
Japan & Far East	1430-1730 (0-1)	1400-2000 (2-3)	0100-0900 (1-2)	0200-0700 (1)

ALL TIMES IN C S T

CENTRAL USA TO:	15 Meters	20 Meters	40 Meters	80 Meters
South East Asia	Nil	1500-1900 (0-1)	0000-0800 (1)	Nil
Hawaii	1200-1800 (2-3)	1000-1200 (3-4) 1200-2000 (3)	2100-0900 (3-4)	2300-0700 (3-4)
Australasia	1530-1800 (1-2)	0700-1030 (2) 1300-1900 (1) 1900-2100 (1-2)	0000-0800 (3)	0100-0600 (2-3)

ALL TIMES IN P S T

WESTERN USA TO:	15 Meters	20 Meters	40 Meters	80 Meters
Europe & North Africa	Nil	0800-1200 (1)	1700-0100 (0-1) 0100-1100 (1)	1800-2300 (1)
Central & South Africa	1000-1500 (2)	0600-0730 (1-2) 0730-1600 (0-1) 1600-1800 (1-2)	1700-2200 (2-3) 2200-0300 (1)	1800-2200 (1-2)
South America	0900-1400 (1)* 0700-1600 (3-4)	0600-1400 (2-3) 1400-1700 (4) 1700-1900 (2) 2200-0200 (1-2)	1700-0500 (3-4)	1800-0400 (2-3)
Guam & Mariana Islands	1400-1700 (1)* 1300-1900 (3-4)	1230-1800 (1-2) 1800-2100 (2-3)	2300-0830 (3-4)	0000-0800 (2-3)
Okinawa	1430-1830 (2-3)	1400-1800 (2-3) 1800-2100 (3-4)	2300-0800 (3)	0100-0630 (2-3)
Australasia	1500-1900 (1)* 1300-1900 (2-3)	0630-0900 (1) 0900-1700 (2) 1700-2000 (2-3)	0000-0800 (3)	0100-0700 (3)
Japan & Far East	1400-1700 (1)	1300-2000 (3-4)	2100-0900 (3)	0000-0600 (2-3)
Philippine Islands & East Indies	1500-1830 (2)	1400-2100 (1-2)	0100-0700 (1)	0400-0700 (0-1)
Malaya & South East Asia	1600-1900 (0-1)	0900-1100 (0-1) 1500-2000 (1-2)	0300-0700 (1)	0400-0600 (0-1)
Hong Kong, Macao & Formosa	1430-1800 (2)	1400-2000 (3)	0000-0700 (3)	0200-0600 (2)

Symbols For Expected Percentage Of Days Of Month Path Open:

(0) None (1) 10% (2) 25% (3) 50% (4) 70% (5) 85% or more.

* Indicates time of possible ten-meter opening.

Ionospheric Propagation Conditions

Forecasts by

GEORGE JACOBS, W2PAJ

144-40 72nd Ave.,

Flushing, Long Island, N.Y.

General Propagation Conditions

10 Meters—DX conditions very poor, with only an occasional north-south opening expected.

15 Meters—DX conditions becoming poorer as the spring months approach, but still fair to good during daytime hours to South America.

20 Meters—Best daytime DX band, remaining open a bit longer than during the winter months.

40 Meters—Fair to good nighttime world-wide DX continues, especially during the early evening hours. Conditions improving for DX on this band to Australasia.

80 Meters—Generally fair nighttime DX to many areas. Band becoming a bit noisier towards the end of the month. On many circuits this band will remain open throughout the night hours, after 40 meters has "dropped out."

160 Meters—Although peak conditions have passed, the band is still quiet enough to permit occasional DX openings to occur. The 160 meter band opens during the "dark hours," approximately during the same times as 80 meters, but on much fewer occasions, with weaker signals.

During February, as the sun continues to travel northward, seasonal propagation characteristics are generally such that in the northern hemisphere daytime usable frequencies are decreasing and nighttime usable frequencies increasing. During February, ionospheric absorption and atmospheric noise levels increase somewhat from the minimum values of the previous months. Towards the end of the month, and continuing through March and April, an improvement should be noticed on all bands on paths going from the mid and higher latitudes of the northern hemisphere to the mid and higher latitudes of the southern hemisphere—for example, from the United States to Australia.

This overall picture of band conditions is intended to indicate qualitative changes in each band from month to month. For specific times of band openings for any particular circuit, refer as usual to the *Propagation Charts* on the opposite page.

This month's *Propagation Charts* are based upon a predicted smoothed Zurich sunspot number of 11 centered on February, 1954. While primarily intended for the month of February, these *Charts* can be used as a guide for working DX up to March 15.

The *Charts* are calculated on a CW radiated power of 150 watts (See "Ionospheric Propagation Conditions" January, 1954), and are based upon basic ionospheric data published by the National Bureau of Standards, Washington, D.C.

1953 In Review

During 1953, the sunspot numbers and associated ionospheric characteristics continued to decrease in accordance with the established cyclic trend.

The **monthly average** sunspot number for November 1953, as reported by the Zurich Observatory, was 1.4. This was the lowest number recorded for any month since April, 1944, when the number was 0.3 and the lowest number recorded for the month of November since November, 1933 when the count was 0.9. The Zurich monthly average sunspot number recorded during November, 1947, the year of peak solar activity, was 127.4.

This **does not** necessarily mean that the minimum of the present cycle has been reached. As discussed at length in "DX and The Sun" (**CQ** July and August, 1953), the sunspot cycle trend is based upon the **smoothed sunspot numbers.** These numbers are the 12-month averages of the monthly numbers. Since 12 months data is necessary for calculating the smoothed sunspot number, the latest available number is for the month of May, 1953, which has been calculated by averaging the monthly numbers between November, 1952 and November, 1953.

Periods of good propagation conditions are expected Feb. 1-4 and 22-28. No severe ionospheric disturbances are presently forecast to occur during February.

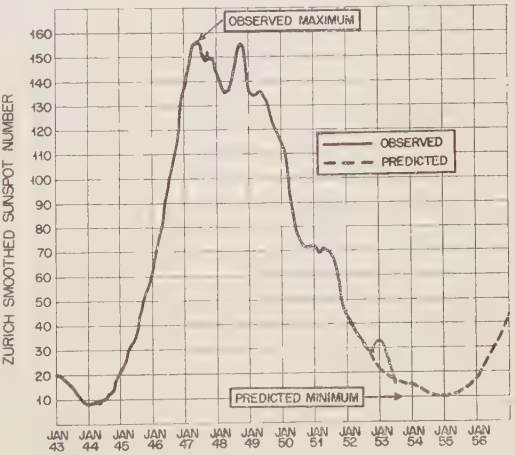
Up to the minute ionospheric forecasts are now being broadcast over WWVH (N. Pacific) at 9 and 39 minutes past the hour on 5, 10 and 15 Mc., and on WWV (N. Atlantic) at 19.5 and 49.5 minutes past the hour on 2.5, 5, 10, 15, 20 and 25 Mc.

Following are the smoothed sunspot numbers for 1952-1953, and for comparison purposes, those for last year (1951-1952), and for 1947-1948 (sunspot maximum).

	1953	1952	1948		1952	1951	1947
Jan.	23.9	43.3	144.8	July	30.6	67.2	155
Feb.	22.6	42.9	142.8	Aug.	27.8	64.0	151
March	19.8	40.2	140.4	Sept.	27.1	61.2	148
April	18.2	35.7	138.2	Oct.	27.5	59.0	152
May	16.5	33.5	135.8	Nov.	26.1	53.6	149
June	—	32.1	135.3	Dec.	26.0	48.1	149

Figure 1 is a plot of the smoothed Zurich sunspot numbers observed during the present cycle (January 1943-May 1953). The dashed continuation of the graph, starting with June, 1953, is a prediction for the remainder of the present solar cycle. This prediction is an estimate based upon the study of the behavior of the previous ten cycles. The minimum of the present cycle is expected to occur during the fall of 1954 when minimum smoothed

(Continued on page 69)



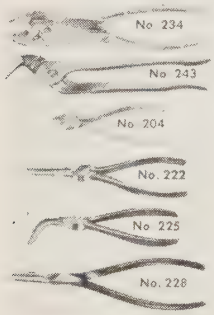
Bringing the sunspot curve from the July issue up to date ("DX and the Sun," page 18) we see the slight hump that centered around January 1953. The curve is now dropping off rapidly.

What's NEW in HAM RADIO

Parts Products Catalogs

Say That You Saw It In CQ!!

Six new PROTO pliers have been recently marketed by the **PLOMB Tool Co., of Los Angeles, Calif.**

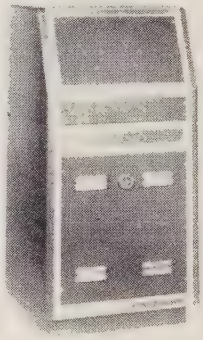


Three precision needle nose pliers, a compound leverage plier, a multiple-groove joint plier, and a diagonal cutting plier are included in this new line. The matched cutting jaws of the diagonal cutters are especially thin, and induction hardened for long wear. Just the ticket for tearing up that surplus gear!

Just off the press is the newest **BUD** Catalog of sheet metal products and electronic components. Well known parts to every amateur that has ever lifted a soldering iron, the complete **BUD** line of products, with concise specifications and information, is shown in this catalog along with suggestions for uses and applications. A "must" in every Ham shack! Copies of the catalog may be obtained by writing to **Bud Radio, Inc., Dept. C2, 2118 East 55th St., Cleveland 3, Ohio.**

All amateurs interested in mobile communication will welcome the new **Carter Dynamotor Catalog No. 753,** recently published by the Carter Motor Co., manufacturers of dynamotors, converters and "Change-A-Volt" dynamotors. The catalog consists of 28 illustrated pages giving complete electrical and mechanical specifications on all Carter dynamotors. Of special interest to the technically minded amateur are the performance charts and oscillograph photos of typical dynamotor performance. Described also is the new Carter heavy-duty generator, cataloged for the first time. A copy of the new brochure may be obtained by writing the manufacturer: **Carter Motor Co., Dept. 16, 2660 No. Maplewood Ave., Chicago 74, Ill.**

The old saying has it that every Ham should have two stations: One that **works** good, and another that **looks** good! The **Elgin Metal-**



formers Corp., Elgin, Ill. (W9GW, prop.), has introduced a new, standard line of metal enclosures that will do much to hasten the end of "haywire" in the Ham shack. Of particular interest to amateurs is the BU-2121 basic console (illustrated). It measures 21"x48"x21" with standard RTMA and WE mounting holes for 19" relay rack panels. Any number of these units may be locked together to form an attractive console enclosure. With the addition of Elgin's Pedestal Drawer Inclosures and Writing Tops, a three-unit control assembly desk may be built up that could house a complete kilowatt station, occupying the space of an office desk! Attractive enough, too, to go in the living room, without ve the XYL! A catalog of the component units of the Emcor tem may be obtained from: **Metalformers Corp., 903 No. Li ty St., Elgin, Ill.**

Flashovers in that new p supply? Here's the solution. **IN X!** It has an extraordinarily dielectric strength, resists spray, moisture, chemicals, co sion, and hot air (Phone men, tention!). It is a clear, quick- ing liquid plastic, and is avail in an easy-to-use aerosol disper Supplied in bulk form for than 20 years to U.S. governm departments, **Insl-X** insulating s is now available to amateurs, vicemen, and experimenters in 12-oz. container. Inquiries sh be directed to **Insl-X Sales Co., Rittenhouse Place, Ardmore,**

All amateurs will be inter in **Centralab's Catalog No.** which contains a complete lis of all the varied Centralab p ucts. Of particular interest to a teurs is the section devoted to JV-9000 series of rotary cera switches, designed to handle watts, and up to 3,000 volts. T switches may be just the thing that new band-switching final plifier! Of equal interest is

line of DD-16 disc ceramics, designed for operation at 1600 volts d.c. These are extremely helpful for TVI by-passing of low voltage leads in transmitters. The "TV" series ceramic condensers are rated up to 30,000 volts d.c., perfect for high voltage by-passing of harmonics. (Two of these condensers in series may be used for transmitters west of the Rockies.) The type 850 Centralab condensers may be used in high-power low-pass TV filters for the big rig, and the FT series are designed for feed-thru condensers to be used in interstage shielding. Obviously, the catalog is indispensable to any amateur contemplating a TVI-housecleaning. A copy may be obtained from your local Centralab distributor, or by writing to **Centralab Inc., 900 East Keefe Ave., Milwaukee 1, Wisconsin.**

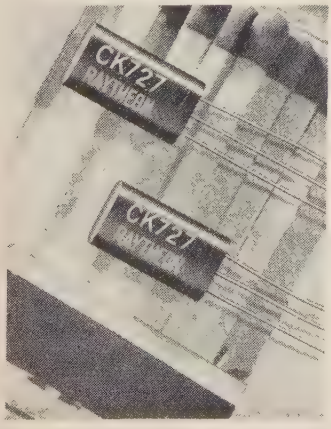
Sylvania Electric Products Inc., keeping pace with the trend to 12-volt automotive equipment has just brought out a complete line of 12 volt receiving tubes.

For the r-f stage, there is either a 12BA6 or a 12BD6. The 12BA6 can also be used in the i-f circuits. The Sylvania 12BE6 is designed for converter service; the new 12AV6 functions as the 2d detector, a-v-c, and audio tube.

The new audio tubes, the 12AQ5 and the 12V6-GT may also be used in r-f circuitry. The popular 28-9 transmitter described in the "Radio Amateur's Mobile Handbook" can be easily adapted for 12 volt operation by using the new 12AQ5.

The new 12X4 rectifier rounds out the complete line of tubes. Next time you go to the local radio emporium, ask about these 12 volt tubes for your mobile equipment!

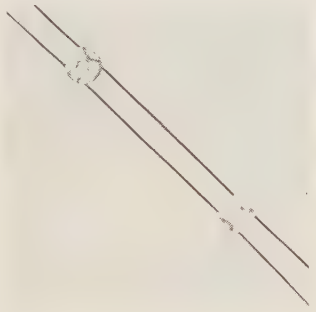
A lot of sound and fury has revolved about the amazing new transistors, but little has ever brushed off on the lapels of the average Ham. Now that Raytheon has introduced the reasonably priced CK-727 transistor, we think that tremendous reader interest will soon appear in transistors. The



CK-727 has an average noise factor of 13 db., an average power amplification of 37 db., and is darned small, as can be seen from the accompanying photograph.

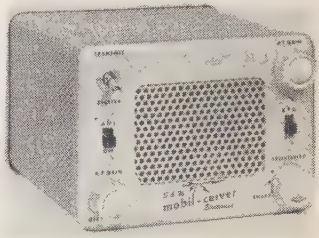
Full details of the CK-727 are given in a data sheet available from: Raytheo nManufacturing Co., Technical Information Service, 55 Chapel St., Newton, Massachusetts.

VHF men! Now hear this! **FRETCO, Inc.** has now on the market an **open-wire 300-ohm line.** While produced primarily for UHF-TV installations, the miniature line is perfect for amateur use on the v.h.f. and u.h.f. bands. Pee-wee polyethylene spacers are used on the line, and the wet or dry losses



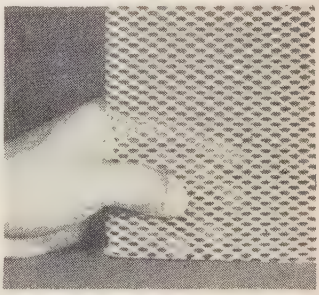
of the line are extremely low. The line is known as "Saucerline" (illustrated) and may be obtained at local distributors. The extremely close spacing prevents power loss and unbalance at high frequencies, and should prove very popular on the 220-Mc. technician's band. Oh yes, the line may be also employed on TV receivers.

After a short whirl at mobile radio, Joe Ham usually finds the weak link in his communication set-up is the car radio! Long on price and short on sensitivity and selectivity, it just doesn't fill the bill. **S&W Electronics, 3418 West Pico Blvd., Los Angeles 19, Calif.** (The brain-child of W6MVK and W6ZUX) has just announced a special mobile receiver for use with converters—the MOBIL-CEIVER. This compact little unit includes many features found only on high quality communication receivers. Variable i-f selectivity, high-Q 175-kc. intermediate frequency transformers, BFO, separate r-f and a-f gain controls, self-adjusting noise limiter, and special ventilated case are among some of the features that will make the avid Mobileer's eyes light up in anticipation. The **MOBIL-CEIVER** will work on either 6 or 12 volts, and features a built-in power supply, with provisions for regulated B plus voltage for the converter. The converter may be seen at your amateur supply house, or complete information may be obtained from S&W Electronics.



Have you ever tried to figure the correct value of a negative temperature coefficient condenser to put in your v.f.o. to reduce thermal heating drift? Well, here's an easy way to do it. The **Sprague Products Co.** has introduced a Capacitor Temperature-Coefficient Slide Rule which substantially speeds and simplifies ceramic capacitor installation problems. Stock values of N750 and NPO type Sprague capacitors may be parallel connected to provide various odd values of temperature coefficient condensers that will correctly fit the particular problem at hand. On the back of the Sprague T-C rule is a key to ceramic capacitor color codes, showing capacitance, tolerance, voltage and temperature coefficient values. The T-C slide-rule is available for 15c, either direct from **Sprague Products Co., 85 Marshall St., North Adams, Mass.**, or through Sprague distributors in all major cities.

How do you like this aluminium mesh grill for the protection of loudspeaker openings? This new **ICA** product could also be used as a decorative mesh over panel openings as an anti-TVI measure—It looks much better than window-screening for this purpose! Finished in a non-tarnishing gold color, it's available in several sheet sizes. The material can be readily cut with a pair of ordinary tinner's



snips. This grill is produced by the **Insuline Corporation of America, 3602-35th Ave., Long Island City 1, N.Y.**, and is available at many amateur supply houses.

The VHF-UHF News

FURMAN C. COBB

c/o CQ Magazine, 67 West 44th Street, New York 36, N.Y.

The device to be described this month is a 6-meter antenna mounted "booster" or r-f stage. It was designed by Joe L. Pryor, W5MJD (Amarillo, Texas) and has proven to be quite useful in improving his signal-to-man-made noise ratio. Joe seems to be surrounded by lots of power leaks, neon signs, etc. that make the interference problem fairly severe (unless a lot of co-ax cable is used) and this is how he solved it.

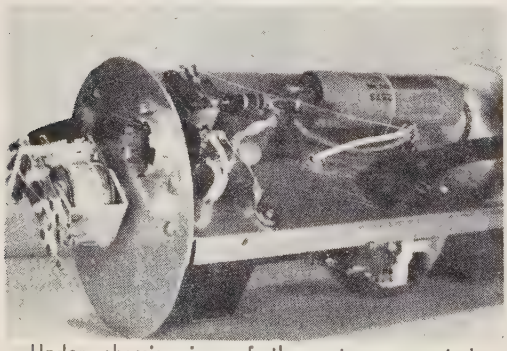
The "booster" is a 6BQ7 in a cascode circuit which is broad-banded and covers the entire four megacycles of the 6-meter band without loss of gain. It has a 15 db. stage gain and in every instance worked out better than a pentode r-f stage in the shack with the receiver. A-c power is supplied right to the "booster" which is mounted in a couple of 46-oz. fruit juice cans. A pair of relays on either side of the "booster" switch it out of the circuit when transmitting.

The photographs illustrate the general method of constructing the "booster." Two large juice cans and some galvanized tin are required to fabricate the housing. One can is used whole, while the other is cut and used as an extension housing to mount the relays. The main can has one end cut completely off and the other end is trimmed so that there is a piece about ¼-inch wide left around the tip of the can. This prevents the chassis holding the r-f stage from slipping all the way through. The other can is cut up and soldered to the main can as shown in *Fig. 1.*

Obviously, the method of building the mounting for the "booster" will vary from constructor to constructor and I have not gone into too much detail on this point.

The chassis layout may also be visualized from the photographs. The tube is mounted so that the input and output circuits are screened from each other by the shield diagrammed in *Fig. 1.*

Chokes, *RFC1* and *RFC2* are bi-filar units wound using a 3/16-inch drill as a winding form. They are made by winding two short pieces of #18 enam. wire side by side for 8 turns. The value of the neutralizing condenser, *C6*, may vary from installation to installation, but will probably be about 1.0 $\mu\mu$fd. It can be made from a short piece of 72-ohm twinlead with about one inch of coupling to start



Under chassis view of the antenna-mounted booster at W5MJD, Amarillo, Texas.

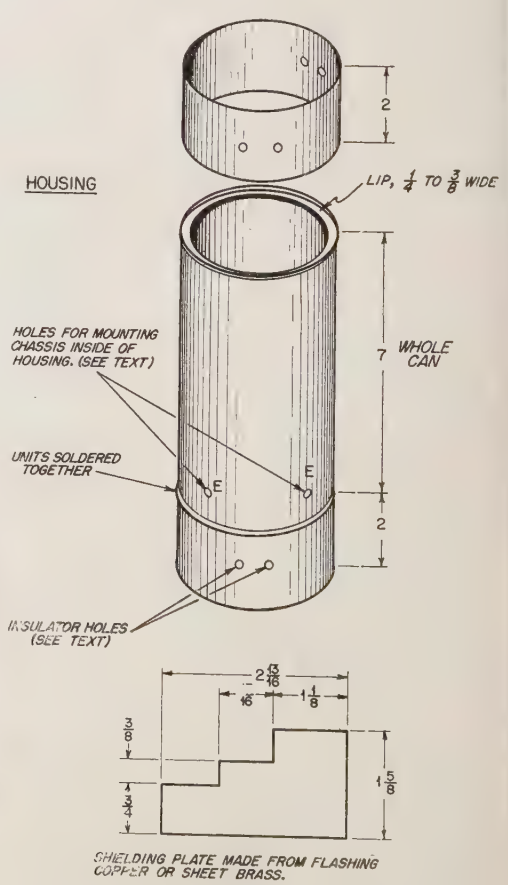


Fig. 1. Details of the "tin can" housing.

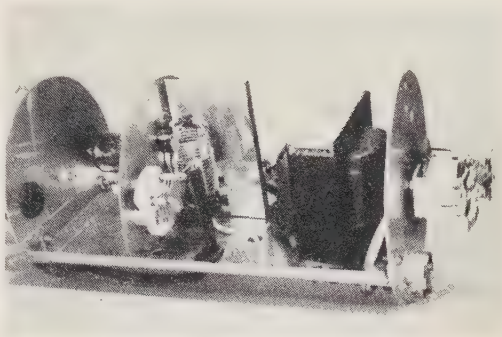
with. Coil, *L1*, is very closely coupled to the cold end of *L2* and is tuned to frequency with the antenna attached.

Coil, *L4*, can be made by winding four turns of #24 enam. wire around coil *L3*, just above the tap, or it can be made from a *B&W #3008 Miniductor* if some of the insulating material is filed off on the inside so that it can be slipped over *L3*.

Tuning Up

With the power supply diagrammed in the accompanying schematic (*Fig. 2.*) the output voltage should be about 200 before 6BQ7 warmup and about 150 volts after. With a test signal, tune up the cascode on 52 Mc. If the stage is neutralized properly it should be possible to swing the 6-meter receiver from one end of the band to the other and not hear any birdies. The neutralization may also be checked by breaking the high-voltage lead and inserting a 0-15 milliammeter in the circuit. If, when the grid coil is touched the plate current does not remain steady at about 6 or 7 ma., it is a fairly good indication that the stage is not completely neutralized. This may be corrected by changing the position of the tap on *L3* or the capacity of *C6*. The W5MJD unit neutralized with about 3/8-inch of connected 72-ohm twinlead.

No other special precautions were observed by Joe, except to make sure that relays are connected to the send-receive switch in the shack and that the switch is one of those with a spring return. This makes sure that the relays in the "booster" do not burn up due to an oversight which left them in the "Transmit" position.



In this view the power transformer (a Merit P-3046) is seen mounted near the base of the 6BQ7. The selenium rectifier is a Federal #1159.

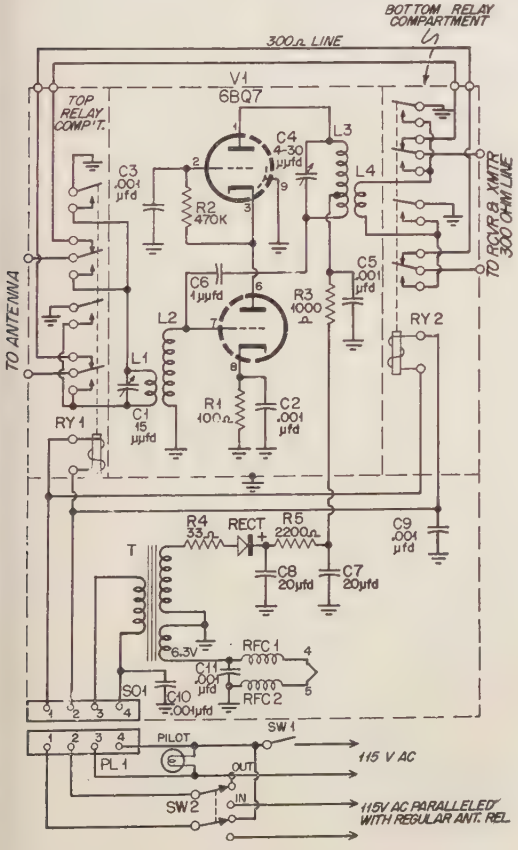


Fig. 2. Wiring schematic of the booster. The two toggle switches are mounted in the shack.

Coil Winding Data

(50 Mc. Unit)

L1—6 turns, #20 tinned on 5/8 inch diam., 3/8 inch long, or Miniductor 3007.

L2—11 turns, #20 tinned on 5/8 inch diam., 11/16 inch long, or Miniductor 3007.

L3—14 turns, #20 tinned, 1/2 inch diam., 7/8 inch long, tapped 3 turns from C6 end, or Miniductor 3003.

L4—4 turns of #24 enam. wound around L3, also see text.

"Microwave Nomograms and Charts"

This is the title of a little booklet just released by **Airtron, Inc.**, Linden, N.J. We draw the conclusion that it is available upon request at the above address. The booklet contains a series of charts and nomograms developing the art of designing and utilizing waveguide components. Apparently there was such a large call for this type of material that the engineering staff at **Airtron, Inc.** decided to put this booklet in the hands of those that can use it. The charts contain data on cutoff frequencies, characteristic impedances, waveguide attenuation, waveguide dimensions, etc. For anyone interested in this field (1000 megacycles and up) this booklet should be quite valuable.

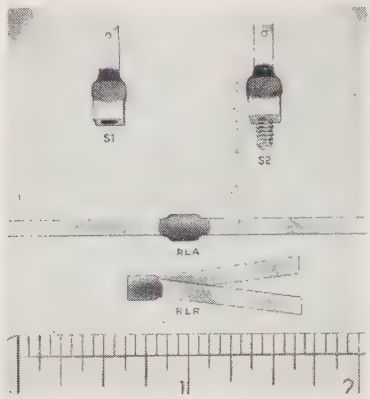
What the Gang is Doing

R. W. Pullen, W4KPB/Ø (Minot, N. Dakota) brings to our attention that the "skeleton slot" antenna built by G2HCG and described in the November column is not quite comparable to the usual "slot." The latter is a term derived from the waveguide aperture antenna with horizontal polarization. Possibly we did not make this clear, and we stuck to the nomenclature used by G2HCG, although as W4KPB points out it is inaccurate.

V. L. Carr, W1WAS (So. Portland, Me.) asks for further dope on the G5CD helical beam installation which has been sent out to him.

Roy T. Tucker, W8LVF (Columbus, Ohio) has sent in a detailed report on the 144-Mc. FM emergency net in the Ohio state capitol. It appears that a very active organization has been formed to operate on 145.26 Mc. and is now known as the Franklin County Civil Defense Emergency Net. A portion of the net also operates 10-meter AM, but W8CXD, W8KEM, W8KMM, W8WXY and W8LVF try to encourage 2-meter work. Most of this group have their own FM equipment (some of it mobile). The remainder of the FM gear is located in the CD stations throughout the city and county. While some of the FM equipment was purchased by CD funds from General Electric, a lot of the Ham gear has been converted from old commercial taxicab mobile equipment. This net sounds so interesting we hope to have further details on it within the near future—possibly with conversion data on the commercial equipment.

Amos Hawkins, W8INQ (Zanesville, Ohio) reports that 220 Mc. activity in and around Dayton is quite strong. Most of the fellows are using 832 finals and crystal controlled converters. Since conditions are against using the 220-221 Mc. portion of the band the gang tries to keep above 221. Some of the common frequencies are:



W8KJT on 221.8 Mc., W8SVI on 220.0 Mc., W8BMO on 221.9 Mc., W8INV on 221.69 Mc. and W8INQ on 221.4 Mc.

Additional Dope on the "Twin-5"

It doesn't seem possible that nearly four years have gone by since the widespread introduction of the W2PAU, or Brownie "Twin-5" antenna. Still a very popular array, it was described in the March, 1950 issue of **CQ** (the Circulation Manager tells me that back copies are not available) and essentially consists of two 5-element Yagis spaced 81" apart. The matching design pictured in the original article centered around 300 ohms (noted in part 1 of the drawing).

Many 144-Mc. operators however use various forms of co-ax cable, or even 450-ohm open wire line. The diagram below shows the methods of matching into 50-ohm co-ax (part 2), 75-ohm co-ax (part 3) and 450-ohm line (part 4).

By the way, we plan on running some more data on this antenna with particular emphasis on its use at 220 and 420 Mc.

Some Thoughts on a New Product

While this may be stealing the thunder from our new section in **CQ** on "parts and products" I do feel that several items should be mentioned and discussed in this column. For example, the other day I noted that **Mucon** (Newark, N.J.) has introduced some subminiature ceramic capacitors that are really small. The photograph will give you an approximate idea. Type S1 has a female thread (4-40) while type S2 has a male thread with capacities ranging from 2 to 10,000 $\mu\mu$fd. (to 2000 $\mu\mu$fd in the standoff unit only). Type RLR and RLA have lead ribbons and body sizes from $\frac{1}{8}$" to $\frac{3}{8}$" square. The range in values from 4 to 7500 $\mu\mu$fd. No doubt about these capacitors reducing inherent series inductance to a minimum for u.h.f. work. We are trying to find out if and when they will be available on the open market from your local parts jobber and distributor.

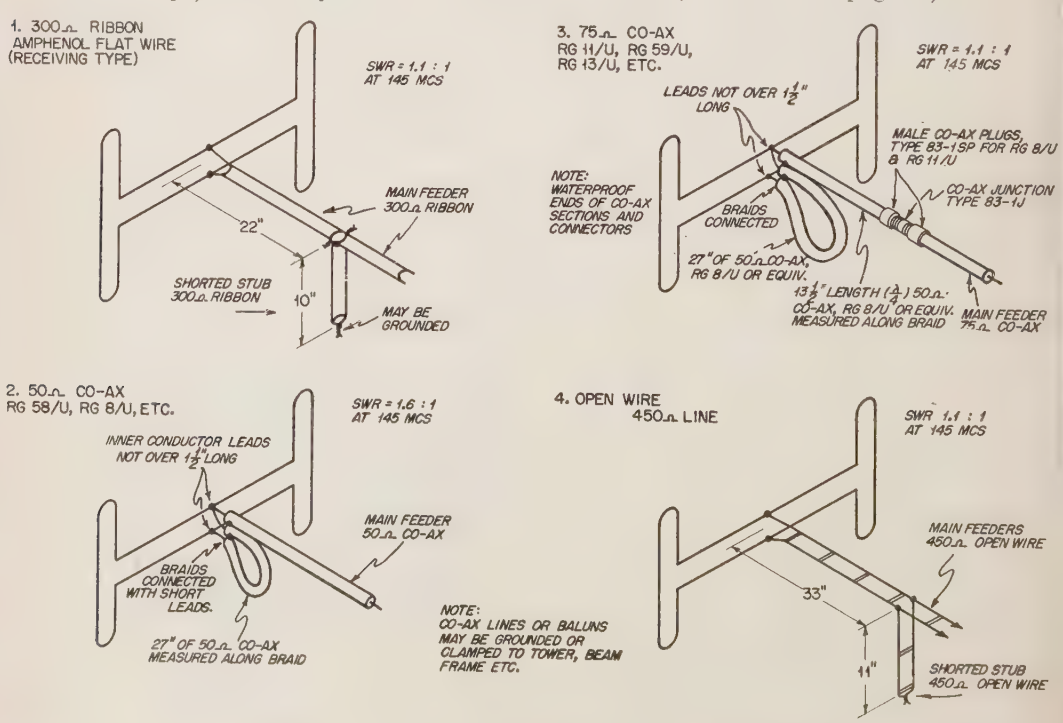
You fellows that are thinking of 420 Mc., and above may be interested in seeing some of the new commercially available "G-string" line now being marketed by David Bogen Co. (29 Ninth Ave., New York 14, N.Y.) It has a loss comparable to that described by K2CHI ("The G-String," **CQ**, April, 1953, page 13) which is about half that of open-wire line and one-third that of the best 300-ohm twin-lead. The line is insulated and comes from the manufacturer with two "launchers." The launchers are supposed to match 300-ohm lines to the antenna and receiver. We must admit it sounds good.

Standing Waves

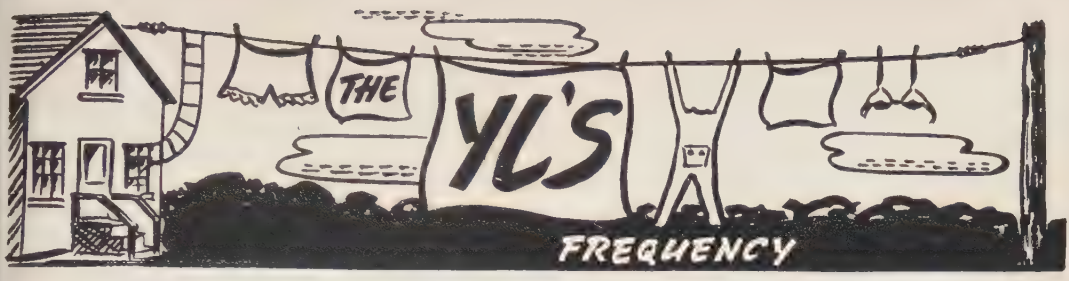
This month we are introducing a few paragraphs on current techniques, news, etc. that are not covered in the remainder of this department. If you like the idea of these short items, please be sure and let us know.

A lot of v-h-f readers have expressed some interest in the appearance on the market of the 6BQ7A. Little definite information is available but the impression is widespread that the 6BQ7 developed a form of displacement on the heater wires which shorted to the cathode. However. these were not entirely caused by thermal expansion of the heater. Reports indicate that the shorts resulted when there was a potential difference of over 100 volts between the cathode and heater. The 6BQ7A has has this defect corrected and is also capable of a little more gain . . . Speaking of tubes, we were quite impressed to see the 26-page booklet issued by the **Amperex Electronic Corporation** (230 Dufiy Ave., Hicksville, N.Y.) on the 5894/AX9903 tube. It is punched for insertion in a small looseleaf notebook. It contains detailed data on the popular twin-triode with application notes, typical performance curves, special features and a description of the tube construction. If you are thinking of using this tube be sure and get this booklet from the above address. Mention that you saw it in this column.

(Continued on page 59)



Matching the "Twin-5" to various feedline impedances.



LOUISA B. SANDO, W5RZJ/Ø

General Delivery, Cortez, Colorado

5th Annual YL-OM Contest

March is just around the corner, and that means the second big contest of the season for the YLs—and the OMs are included in this one—the *YL-OM Contest.* This will be the fifth annual run-off of this event. Dates have been set for Saturday, March 6, and Sunday, March 7. Here are the details:

DATES: Start Sat., March 6, at 1300 EST. End Sun., March 7, at 2400 EST.

ELIGIBILITY: All licenced OMs, YLs and XYLs.

FREQUENCIES: All bands. Cross-band operation permitted.

PROCEDURE: Call "CQ YL-OM."

EXCHANGE: QSO number: RS or RST report and State, U. S. Possession, VE District or Country.

SCORING:
a—One point for each station worked (YL to OM or OM to YL only.)
b—Stations and multipliers count only once, regardless of band or mode of operation.
c—Add number of points and multiply by number of different States, U. S. Possessions, VE Districts and Countries worked.
d—All phone contestants running 150 watts input or less **at all times** may then multiply final score by 1.5
e—All CW contestants running 150 watts input or less **at all times** may then multiply final score by 1.25
f—Maryland and District of Columbia count as one State.

AWARDS: Highest OM score—regardless of mode of operation—cup and certificate.
Highest YL score regardless of mode of operation—cup and certificate.
Highest OM score—phone to phone—cup and certificate.
Highest YL score—phone to phone—cup and certificate.
Highest OM score—CW to CW—cup and certificate.
Highest YL score—CW to CW—cup and certificate.
Second and third highest in each category will receive certificates.
Winner of one award is not eligible for any other award.
These cups are awarded on a yearly basis with a three-time winner obtaining permanent possession.

LOGS: Copies of contestants logs must be postmarked not later than March 27, 1954 and must be sent directly to Ruth B. Siegelman, W2OWL, Vice-President, YLRL; 1414 Wythe Place, Bronx 52, New York. All contestants must fill in their own logs while operating. No help is permitted.
Contestants are requested to send in separate phone-to-phone, CW-to-CW, phone-to-CW and CW-to-phone logs. Please state power input, and send copies of logs in, regardless of size of score, to help in cross-checking others logs.

Meritorious Service

As winter storms wreak their usual havoc, Hams, as usual, come to the rescue by handling emergency traffic. WØKFN, Catharine Tepley, received credit for maintaining emergency communications when her home town of Pipestone, Minn., was cut off on Nov. 20th from the outside world by a sleet storm. All telephone and telegraph lines were out of order from early Friday until late Sunday, Nov. 22. WØKFN's antenna, protected by an evergreen tree, survived the storm. With the first plea for help Catharine contacted W9AAG, who relayed to WØARY, who phoned the telephone company's division headquarters in St. Paul. Thereafter WØKFN and WØBWN in Minneapolis maintained contact, and for three days all emergency messages left Pipestone via Catharine's station.

Beware !

We all know the potential danger of electricity—and are often warned of it. In fact, most Hams are on the lookout for "hot" gear, but we're not always on the lookout for other trouble spots. W8ATB, Esther, recently suffered a harrowing experience with 117 volts a.c.

She had used her automatic washer but had not turned off the water. She reached to turn it off and at the same time took hold of the sump pump—which had a short in it to the 117-volt line. Both her hands were held fast with current coursing through her body. She was alone in the house, so calling for aid was useless. She managed to kick one a-c plug from the wall socket, but it wasn't the one to the pump. All the time she had been praying for help—and suddenly she was free. She managed to get upstairs to the phone, and later the doctor told her that the only thing that saved her was a strong heart. Esther says that the muscles of her right arm were tied in knots and her left wrist very sore, but both are coming along fine. She also expresses thanks to all those who have sent cards and letters, and warns everyone to "Be careful!"

Here and There

Speaking of recuperating, we've recently had a couple of letters from W8NAL, Carmella—one just before she underwent surgery (for TB) at Cleveland, and another now that she is back at Molly Stark Hospital in Canton, Ohio. Carmella says she came through surgery in fine shape but needs another six months of strict bed rest after which she can gradually start taking on extra activities. "This means the gang will have to wait a little longer for my replies," she adds. "Since your write-up in CQ I have received scads of cards and letters—from Ireland, Guam, Canada, all U.S. districts but the first and sixth and from many non-amateurs. It's wonderful what one acquires through these FB radio friends—I am proud to be one."

W5VIL, Gladys Landry, experimenter and UHF enthusiast, is looking for skeds on 220 Mc.

A note from W2TUK commending the efforts of **W2KEB** during the Mineola Fair and Long Island Agricultural and Industrial Exhibition. At the amateur radio exhibit Georgianna operated the station, K2DHC/2, every day from opening time to closing time (1 to 11 p.m.) with only time out for dinner. . . . Attending the Oklahoma State Hamfest No. 15, W5CA met YLs **W5VSG, SNL and PWN. . . . W7SFR**, Lorraine, tells of a big write-up in the **Portland Oregonian** about gals in amateur radio with a full page of pictures, including two NYLON net members, **W7NJS**, Beth, and **W7RVM**, Helen. Among the other net members, **W7PTX**, Betty, is back at Mukilteo. She is a member of MARS. **W7GXI**, Marge, also a member of MARS, shot a deer during hunting season. **W7QYN**, Lois, has been waiting for Air Force MARS membership. She checks into the Washington net, is on a 2-meter local net and handles lots of traffic.

According to **W6PCN**, Peggy, it looks like San Francisco might finally be developing some YL activity. The **San Francisco Radio Club**, which admitted its first YL in its 25-odd years of existence just about three years ago, now has five licensed YL members. They are **W6PHT**, Cynthia, who, with her OM, PIH, got their tickets when the Novice license first became available. She's on 75 and 10. **W6QMO**, Jeri, also came up through the Novice ranks with OM, PHS. Jeri's active on 80 and 10 CW and on 10. She got into club activities the hard way when she handled the cook tent for Field Day. **KN6CUT**, Myrtle, got her ticket in October after 19 years of exposure to Ham radio, first through her brother and then, with her OM, AHH. She is on 80, and will join Bob on 75 and 10 when she makes General Class. **KN6CUV**, Lee, whose OM is KN6BZY, will also be on 80 till she gets her general. **W6PCN**, Peggy, was the first licensed YL in the club and has just finished a year as secretary and editor of the club newssheet. She and OM, GCV, are on 20. They've put up a beam, succumbed to NBFM, and added a phone patch, so they're handling a load of traffic from Japan and Alaska.

The **Long Island Press** did a picture story on women radio amateurs on Long Island. YLs photographed were **W2JZX**, Vi; **K2ESO**, Lea; **W2SUR**, Esther; Winnie XYL of W2UXY; **W2IGA**, Ruth, and **W2MWY**, Ann. **W2RTZ**, Hope, is now at ARRL Hq. as an official log checker, and hopes to be on the air again soon.

220-Mc. Schedule?

W5VIL, Gladys Landry, of New Orleans, La., is looking for schedules on 220 Mc. Yes, she has a Technician's license (May, '52)—and she's putting it to good use. Her transmitter is a modulated tuned-lines oscillator consisting of a 24G with a pair of 6V6's as modulators. The input to the oscillator is 30 watts. Antenna is a horizontally polarized folded dipole fed with 300-ohm twinlead. The receiver is a superregenerative 9002 followed by a 6J5 and a 6V6 audio.

Gladys feels the higher frequencies are a great challenge to Hams and a chance to see if we can do something with those "useless" frequencies. Of course, she's interested in the lower frequencies, too, and has been looking forward to ragchewing on 20. Her OM, W5VUH, got his General Class ticket in July '52. This was one of those cases where the XYL got her ticket first so that her OM would become a Ham. Now they both enjoy it, especially operating mobile with his call. Norm also has built a 500-watt all-band rig for their radio room. Gladys likes to build, too, and has been putting together a transmitter using transistors instead of vacuum tubes—just for the fun of experimenting.

W5VIL first became interested in radio when she worked in the Electronics Department of the Industrial Manager, USN, Eighth Naval District (a ship repair outfit). Her OM is an electronics engineer she met while working for this office. Presently she is the assistant to the Secretary to the Industrial Manager, USN, Eighth Naval District. Gladys also is secretary of the Westside Amateur Radio Club of New Orleans.

SK

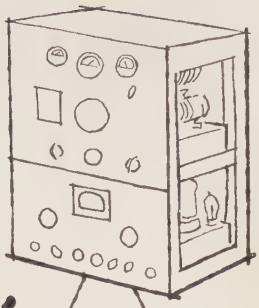
Here we go again—yep, we're moving once more. Been at this QTH 2½ years, as long as we've ever stayed put in one spot. We'll be in the Ø district now, at Cortez, Colorado. And we expect to be a working girl again, too (not that we haven't been right along what with homemaking and caring for the two jr. ops!). At this writing all we can say is that both the OM and yours truly will be working for a new agency, at Towoac, set up to help the Southern Ute Indians.

You know this signature, "33", that we use every month, causes a lot of comments. It is used by all YLRL members as an expression of sisterly affection. After explaining this on the air recently to an OM, W7PJY broke in and quipped, "You mean 33's are half of an 88 (cover the left half of an 8 and you do get a 3)—they leave off the kisses but send the love." Very clever, OM!

So, 33 till next month—**W5RZJ/Ø**

Members attending one of the summer meetings of the New York City YLRL. Left to right, seated: W2UXM, Sally; K2DYO, Dot; W2TBU, Kit; W2OWL, Ruth; W2EEO, Madeline. Standing: Ruth Schlitt; W2IGA, Ruth; CO2MR, Marie Rose; W2RTZ, Hope; Helen Zuparn; W2VXC, Ethel; W2IQP, Lil.

for Peak Performance...



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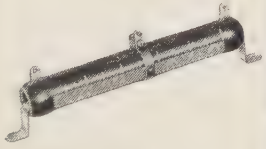

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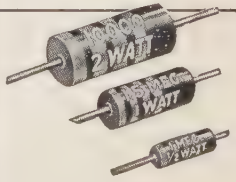

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Test Equipment..... ... in the Ham Shack

HOWARD BURGESS, W5WGF

925 Adams St., S.E., Albuquerque, New Mexico

(Part III of This Series)

R. F. Signal Generators

The amateur who builds or repairs his own equipment most certainly needs an *r-f* signal source for alignment purposes. There are a great many Hams, though, who purchase ready-made gear. Sooner or later, however, the temptation to "peak 'er up just a little" will overcome even the conservative individual and we then have another candidate for a signal generator. It appears to be a common failing among us that some of the most useful tools are the least complicated and the ones we do without. Signal sources seem to fall into this class.

During the past few years the field of signal generators has been developed to the point where a comprehensive discussion of the subject would require volumes. Due to limited space the present discussion will cover only that small portion most suited to amateur radio.

The common r-f test signal generator can be divided into two important parts, the oscillator and the attenuator. The attenuator, in many cases more difficult to construct than the oscillator, will be discussed later. Of course the oscillators used can be divided into two types, the self-excited for general coverage and the crystal for precision spot frequencies.

Selecting the Oscillator

In selecting a circuit for the self-excited test oscillator any of the basic circuits such as Hartley, Colpitts, Franklin or others may be used. Several versions of these common circuits have appeared in recent years under such names as Clapp, electron-coupled, or other designations. Regardless of many heated discussions in the past, it is generally considered by unbaised workers that given equal treatment, there is little stability difference between the basic circuits.

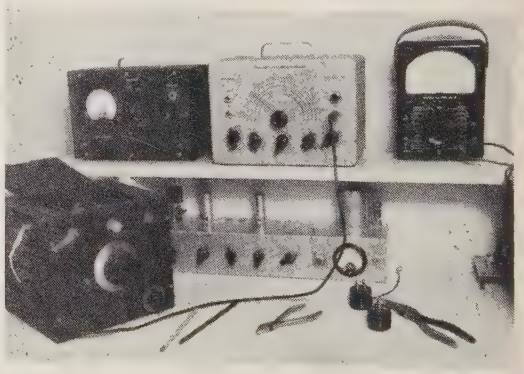
Having eliminated the question of stability the selection is more or less determined by the physical layout possible with various circuits. It is frequently convenient from a switching standpoint to use a circuit where only one or two terminals need to be switched on the inductor. Other times, selection of specific parts available such as the tuning condenser will indicate the use of another such as the Hartley circuit.

If one is contemplating the construction or purchase of a signal generator, the mechanical layout of the oscillator should be given considerable attention. This applies to the dial as well as the condenser and bandswitch. A dial or tuning condenser which has backlash or lacks resetability will render the most stable oscillator useless. A desirable type of bandswitching arrangement is the movable coil turret, but because of its cost it is usually out of the average Ham price range.

A good substitute for frequencies below 100 megacycles is the sub-assembly type of construction. In this method a rugged tuning condenser and other oscillator components including a well-made wafer type bandswitch and coils are mounted on a small sub-chassis. With this construction, very short leads are possible and stresses on the main chassis or cabinet are not readilly transferred to the oscillator assembly. This also lends itself to better shielding if such is desired.

For the brave few who insist upon building all of their equipment, the two most tedious tasks of a general coverage r.f. generator are

(Continued on page 64)



A Heathkit Model SG7 signal generator is used by the author to align a portable receiver. The long chassis under the shelf is a crystal calibrator. A multimeter connected to the output of the receiver is on the right of the generator.

Cover Photo Story:

Faraday Shield for the Antennascope

ELBERT ROBBERSON, W2FRQ

44 Sintsink Drive, East, Fort Washington, N.Y.

Soft-drawn tubing is bent to diameter, then one end sawed off at point of meeting (top photo). The remaining end is slit and flattened, and the edges smoothed (center photo). Solid wire is then pushed into the tubing, using the straight portion as a guide to prevent compression kinks (bottom photo). At this operation, the end of the tubing is still offset to facilitate insertion of the wire. After the proper number of turns have been pushed through, it is bent back into the main plane of the circle.

Amateurs using that very popular little r-f bridge, the "Antennascope,"[1] sooner or later notice that resistance readings vary with the grid-dip oscillator coupling and the placement of the various items in the test setup. This difficulty is largely due to capacity coupling causing residual current which cannot be balanced out. Such a condition makes it appear that the circuit under test is reactive when it actually may not be, and is, therefore, a source of inaccuracy.

A Faraday shield will cure the fault, allowing the full degree of magnetic coupling while completely eliminating electro-static coupling. Construction is not complicated or difficult.

The first thing to be determined is the minimum number of turns required in the input coil for the particular g.d.o. being used. This can be done with small, bunch-wound coils of insulated wire. The fewest number of turns that will give a satisfactorily high meter indication should be used. With the *Millen* instrument shown in the photograph, four turns are ample from 1.7 Mc. to 32 Mc., and for higher frequencies, two turns give maximum sensitivity. Some instruments require only one turn.

A Simple Faraday Shield

In this case, a shielded one-turn input coil can very simply be made from a few inches of RG-58/U coaxial cable. One end is skinned, and lugs are put on the shield and central conductor. At the other end, the outer sheath and the braid are cut back approximately ¼" and the insulation trimmed from ⅛" of the inner conductor. The cable is then bent into a loop which will just slip over the g.d.o. coil, and the sheath marked where the cable end touches. At this point, two girdling cuts should be made through the neoprene cover ⅛" apart, and this little piece removed. This exposes the outer braid, and the end of the inner conductor should be soldered to it at this point. Care should be taken not to melt the dielectric, and the connection should be cooled immediately after the solder has flowed. The loop should be connected to the *Antennascope* input with the braid connected to the ground terminal, then formed so the g.d.o. coil can conveniently be coupled. Place the g.d.o. as far as possible

(Continued on page 54)

1 W. M. Scherer, "Building and Using the Antennascope," CQ, Sept., 1950, page 13.

(from page 52)

from the exposed "hot" input terminal.

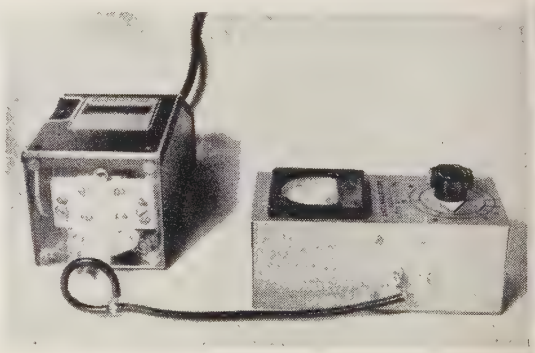
On the lower frequencies, or with oscillators having a low-*Q* tank, more than one turn will be required. The required number of turns can be wound inside an incomplete loop of copper tubing which will provide the necessary shielding, as well as mechanical protection to the coil.

A short length of *soft-drawn,* ¼" tubing is used. It should be tubing which has not already been bent, since such working hardens the copper and makes short-radius bends almost impossible. Although only about 4" of the tubing will be used, working with a longer piece will make the forming operation easier.

One complete turn is tightly wrapped around a form the size of the g-d-o coil, and the tubing is then cut to size. Slit and flatten the terminal end of the tube, ream off the inner burrs, and file all edges smooth. This is the shield. All that is required now is to get a coil having the required number of turns inside the tube.

Use solid-copper (not stranded) plastic-insulated wire. Number 20 will do for 2 or 3 turns, but #28 gauge will push easier if more turns are needed. On the first pass, push through enough wire for the whole coil.

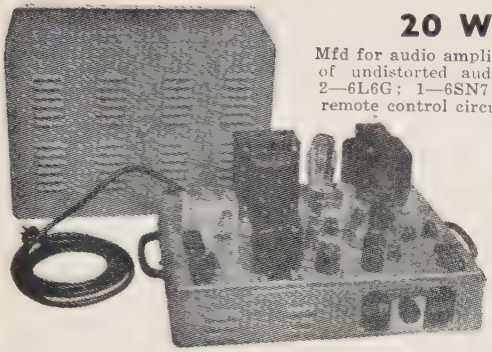
After the required number of turns are pushed into the loop, the curved end of the loop is bent so it is in line with, and almost



1. A one-turn shielded loop of RG-58/U may be ample for the higher frequencies, depending upon meter sensitivity and the Q of the g-d-o output circuit.

touching, the end of the opening in the straight portion. Gently take up on the wire as required so that it is all inside the shield, and push small pieces of spaghetti over the ends to prevent cutting the insulation. One end should be soldered to the terminal, or ground end, of the copper tubing, and the other fitted with a lug. Drill a hole in the flat end with a #25 drill, bend as shown in the photograph, and the assembly is ready to connect to the *Antennascope.* Make certain, of course, that the shield is connected to the grounded-input terminal. Operation should now be free of any irregularities due to capacitive coupling.

ESSE SPECIALS

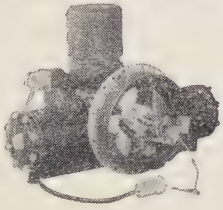


20 WATT AMPLIFIER: Brand New

Mfd for audio amplifier in Measured Music Systems. Amplifier delivers 15 watts of undistorted audio or 20 watts maximum. Tubes used and included are 2—6L6G; 1—6SN7; 1—6SJ7; 1—5U4. Also 1—6AL5 and 1—2D21 used in remote control circuit. Treble, bass, vernier volume and master volume controls are provided. Sturdily built for continual operation in beautiful gray crackle cabinet 17" x 9¾" x 12½" with carrying handles and key lock cover. Unit is foolproof and trouble free, ideal for use in skating rinks, dance halls, etc. Has Phono and 600 ohm line inputs. Circuit diagram provided with each unit. Original Manufacturer's price on this item understood to be $129.50. Your price, brand new with all tubes, for 110-120 V. 60 cycle operation..... **$24.95**

Can be supplied for 110 V. 25 cycle operation..... **$5.00** extra

M-1 SERVO UNIT FOR BEAM ROTATION



Unit has self-contained hydraulic pump actuated by 27 V.—11 Amp. 1/5 hp. motor which pumps oil into either side of hydraulic piston giving better than a 100 lb. torque to cable drum. Unit is reversible by actuation of either of two self-contained solonoid hydraulic valves. Connect by cable around antenna beam for any desired rotation speed. Greater adaptability than any other surplus device on the market.
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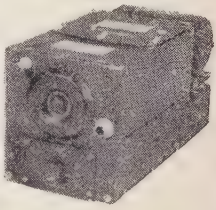
829	7.50	7C5	.75
832	7.50	7Y4	.75
832A	8.50	12A6	.50
GL-846	20.00	12C8	.50
851	25.00	12J5GT	.50
852	12.50	38/VT38	.50
860	3.50	39/44	.50
954	.35	45/VT52	.50
955	.35		

CAP—75 meter Mobile ATTENTION! BC-454 RECEIVER—3-6 Mc.



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Complete with Selsyn Transmitter & Indicator calibrated from 0-360 degrees. By use of the transmitter on the beam, indicator will show position on rotation, or use for TV antenna rotation by attaching TV antenna to transmitter shaft and setting indicator. (Not large enough for rotation of heavy Ham beams.) Unit has self-contained transformer for illumination of indicator dial. Size 6¾ x 6¾ x 8⅜".
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Broad Band . . .

PE-101-C Info

Editor, CQ:

During my recent conversion of the PE-101-C dynamotor to 6-volt operation, I reconnected the low-voltage armature windings from Simplex Lap to Duplex Lap and got the following approximate load readings: high voltage pin M to ground—420 volts at 170 ma. With simultaneous readings of pin M to ground and pin H to ground, the following readings were observed: pin M to ground—400 volts at 140 ma; pin L to ground, 200 volts at 50 ma.

This information may be of some interest to owners of the PE-101-C dynamotor who will want to increase the output with only 6 volts input.

G. M. Higgs, W6AEK

Grass Valley, Calif.

Bouquets

Editor, CQ:

The article in the October issue by W6SAI on the gamma match is the clearest, most understandable explanation that has come to my attention.

John H. Elder, Jr., W3RSB

Pittsburgh, Pa.

Editor, CQ:

This is the first fan letter I've ever written. Bill's article is the best written and simplest to understand.

Major E. Murrill, W8OK, ex-W6OQ

Falmouth, Mass.

Scratchi vs. Snorlock

Editor, CQ:

Where's Scratchi every other month? I liked him very much!

Horace Smith, W9PPD

Hagerstown, Ind.

Editor, CQ:

I want you to know that every single Ham that I've talked to since you quit publishing "Scratchi" has been very disappointed.

Elza Lenn, W7SMB

Tacoma, Wash.

Editor, CQ:

On page 63 of the December CQ, I noticed your question, "What happened to all those that wanted anything but Scratchi?" I doubt if those who wanted anything but, realized how bad something else could be until you published Snorlock Ohms.

I agree with W5PPS, Snorlock is a poor excuse for humor—give him the editorial axe at once.

William C. Ryder, W1JNM

Chatham, Mass.

Editor, CQ:

Snorlock Ohms sort of caught "H" from the Scratchi fans in the latest BROAD BAND section of CQ. The comment seemed so overwhelming and one-sided that I am moved to express my own very enthusiastic vote for your continuing to print the adventures of Snorlock Ohms.

With apologies to the author of Scratchi, I can only say that I have tried and have not succeeded in working up any interest in his articles. I hope you will continue to present them 50-50.

Donald F. Hemenway, W3SQP

Washington, D.C.

Test Equipment Series Liked

Editor, CQ:

Just to tell you that I am enthusiastic about the series that you have just started on "Test Equipment in the Ham Shack." Just completed reading the first article (December, 1953, p. 23) on tube checker and found it very valuable. I hope the series will contain similar articles on all the other equipment that should be valuable around the Ham shack.

Ralph H. Turner, W8HXC

Oberlin, Ohio

(Continued on page 58)

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- RECEIVERS — TUBES — PARTS

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BC-496	2-POSITION RECEIVER CONTROL BOX		2.95
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BC-453	With tubes	19.95	
BC-454	RECEIVER. 3.6 MC. With tubes	12.95	
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		Used	New
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FT-225	MOUNTING PLATE for BC-456..		2.25
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BC-458	TRANSMITTER. 5.3-7 MC. With tubes	9.95	

HS-18 HEADSET, High imp. New $2.45
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250 TL TUBE
Limited quantity! Order now!
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ADDITIONAL SECTIONS. Each only. 75

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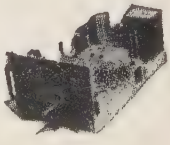
UHF TRANSMITTER



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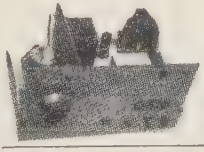

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(from page 56)

Editor, CQ:

Just wanted to take my pen in hand and express my appreciation of the article, "Test Equipment in the Ham Shack" by Burgess in the December issue. This is a subject that has always been of very much interest to me, and I am more than glad to see that it is only the first of such a series. Swell!

Everett V. Brant, ex-W8PQH

Detroit, Mich.

Still More of QSL Percentages

Editor, CQ:

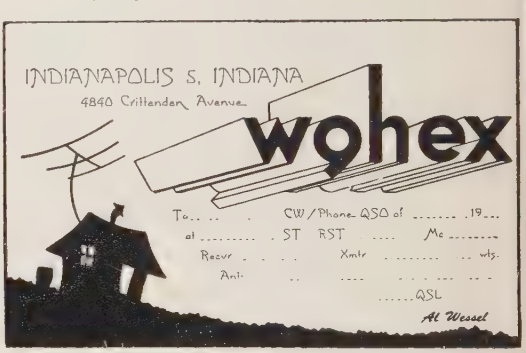
The QSL returns reported by W9HEX (CQ, October, 1953, page 10) and WØKV (CQ, December, 1953, page 11) have prompted me to check on my own.

Although I only operate 160 meters during the daylight and my contacts are subsequently mostly G's, I have achieved, in two years and three months a return of just over 76%. The actual figures were 228 QSL's sent out and 175 received.

And, in writing, I must tell you that the "DX and Overseas News" feature by KV4AA, and "Novice Shack" by W9EGQ are, for me, the main interest in CQ.

F. Allan Herridge, G3IDG

London, England

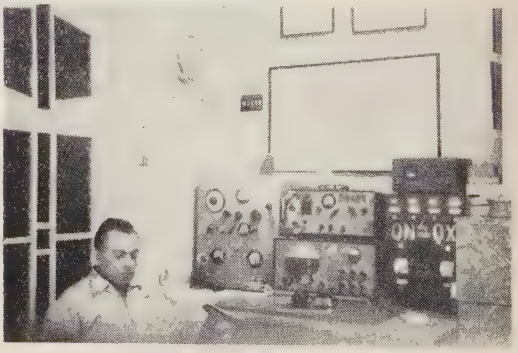


Editor, CQ:

I was greatly interested in the reaction to my letter in the October issue. My QSL card is shown for the benefit of WØKV and others. Let's see more ideas on the subject.

Al Wessel, W9HEX

Indianapolis, Ind.



Editor, CQ:

Since becoming ON4QX I only work 28, 21 and 14 Mc. DX. I am very sorry to report that only 45% in the world of amateurs send a QSL. Here are my statistics.

CT—10%; PA—80%; F—45%; ON4—52%; LA—3%; W1—70%; W2—11%; W3—68%; W4—60%; W5—80%; W6—71%; W7—98%; W8—40%; W9—60%; WØ—80%; VK—71%; OA—0%; MI—10%; ZL—35%; ZS—8%; OH—90%; DL—90%; HB—30%; I—10%; English Dominions—30%;

French Colonials—80%; and Spanish Colonials—70%.

Why do OA4AK, MI3AB, ZB2A, PY5TQ, ZE5WL and W6KH stay on the DX bands? They promise 100% QSL via bureau. After one year of waiting I send a new QSL direct, no answer. I sent a second with coupon, no answer. A third one with two coupons, a photo of the shack and a series of stamps—no results!

I lose my temperature and courage.

Bob.h.th.Berge', ON4QX

Anvers, Belgium

Editor, CQ:

Below are my results for a year and a half on the air.

W1—67%; W2—100%; W3—92%; W4—90%; W5—85%; W6—91%; W7—89%; W8—97%; W9—89%; WØ—93%; foreign—89%. A total of 502 cards sent for an 89% return.

Don Vandenberg, WØKBD

Colorado Springs, Colo.

One Less Solution — —

Editor, CQ:

Just suddenly discovered that the fourth solution from "In a Fit of Pique" (July, 1953, page 28) will not solve the problem. The moveable semaphores cause TV picture flicker by acting as reflectors—the Ham is still blamed.

Egils Evalds

Philadelphia, Pa.

Fire at World Radio Laboratories

A serious fire at press time has destroyed the OLD plant of the World Radio Laboratories, Council Bluffs, Iowa. We are informed directly by Leo Myerson that business is continuing as usual from his new ultra-modern building. Slight delays in the delivery of a few items may occur, but all orders will be filled as quickly as possible.

VHF NEWS

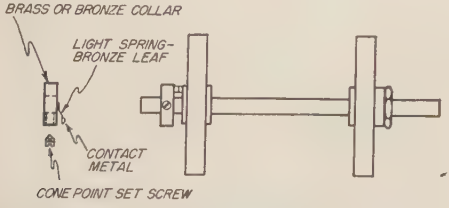
(from page 46)

Converter Oscillator Stability

While building up a 144-Mc. converter similar to the one described by W2PAU (November, 1952, page 21); Ed Stewart, W3DHH encountered an interesting problem on oscillator stability. It was found that weak stations could not be tuned in and strong stations were very hard to peak. After ascertaining that all circuit components were securely mounted and vibration had been minimized, the new VHF-1-D split-stator condenser was investigated. Even considering the fact that it is of excellent workmanship and that the oscillator circuit is theoretically balanced (the rotor carries no r-f current) there is a good chance that frequency jitter and noise may occur. Obviously, this is a borderline critical condition (the extremely high-priced versions get around this through the use of pyrex ball bearings and ceramic shafts) and may not be observable in every case.

The solution to the problem is shown in the accompanying drawing. A brass collar with a brush type contact is slipped on the rear shaft extension. This effectively shorts the inner and outer bearing races with a wiping contact that is independent of the balls.

Weak signals now ride in smoothly as the dial is rotated.



SMALL COLLAR OF NON-MAGNETIC METAL, FITTED TO SHAFT. ADJUST AND HOLD IN PLACE WITH CONE POINT SET SCREW. INSTALL ONE ON FRONT BEARING IF NECESSARY.

COMMAND SET ROUNDUP

(from page 19)

6. "Putting the BC-455 on 10," Everett J. Gilbert, W9MSP, **CQ**, September, 1948, p. 45.
7. "Power-House Portable," Clyde C. Larry, W6GCS, **CQ**, October, 1948, p. 45.
8. "Bandspreading the BC-455," George E. Bidwell, W9FIS, **CQ**, November, 1948, p. 50.
9. "A Double-Conversion Receiver for $30.00," Allen A. Engelman, W8MYU, **CQ**, February, 1949, p. 21. (Using BC-453 with converters.)
10. "Screen Grid Modulating the Command Rig," Robert Hall, WØCRO, **CQ**, September, 1949, p. 35.
11. "Command Set Special," F. A. Bartlett, W60WP/6, **CQ**, November, 1949, p. 18.
12. "TVI-Proofing the Command Transmitter," Samuel J. Lanzalotti, W2DVX, **CQ**, March, 1950, p. 19.
13. "Modifying the BC-459 for TVI-Free 40-Meter Operation," H. S. Brier, W9EGQ, **CQ**, June, 1950, p. 27.
14. "SCR-274N Transmitter Modifications," James N. Whitaker, W2BFB, **CQ**, August, 1950, p. 24.
15. "At last, A Practical All-Band Heterodyne-Type VFO," L. Denis Shapiro, W2URX, **CQ**, December, 1950, p. 16.
16. "War Surplus for Civil Defense," P. S. Rand, W1DBM, **CQ**, part 1: April, 1951, p. 11. Part 2: May, 1951, p. 23.
17. "Mobile With the ARC-5/SCR-274N," Lt. Cdr. Paul H. Lee, W4RXO, **CQ**, May, 1952, p. 55. (Correction June, 1952, p. 69.)
18. "On 15 Meters—Quick," F. N. Lem, W2CTE, **CQ**, August, 1952, p. 42.
19. "40-Meter Mobile With Your ARC-5," Lt. Cdr. Paul H. Lee, W4RXO, **CQ**, March, 1953, p. 62.
20. "Bandspread Dial for the Command Receivers," Jesse O. Bostwick, W7LDT, **CQ**, March, 1953, p. 34.
21. "Crystal-Control Adapter for the BC-696 A," Henry R. Greeb, WØFVD, **CQ**, April, 1953, p. 54.
22. "Put Your SCR-274N on 160 Meters," Eugene Westervelt, W9DRJ, **CQ**, June, 1953, p. 55.
23. "Easy-Way Heterodyne Exciter, The," Major R. H. Mitchell, W6TZB, **CQ**, March, 1953, p. 21. (Converting "Command" receivers to a VFO.)
24. "New Simplified Q5-er," Robert H. Weitbrecht, W6NRM/W9TCJ, **CQ**, July, 1953, p. 25.
25. "Lazy Man's Q5-er, The," Technical Topics, **QST**, January, 1948, p. 40.
26. "ARC-5 Transmitter Modifications," T. A. Previtt, W9UKT; John McIntosh, W8ZGO; B. Goodman, W1DX; F. W. Wright, Jr., W2UWK; J. R. Abbott, W6ZOL; Don Imhoff, W8YFS, **QST**, June, 1948, p. 6.
27. "Triple Conversion for the Communications Receiver," William I. Orr, W6SAI, **QST**, September, 1948, p. 53.
28. "Adapting the 274N Series Transmitters for 14 Mc," William I. Orr, W6SAI, **QST**, September, 1948, p. 31.
29. "Crystal-Controlled Plug-In Converter for the Q5-er," John L. Steward, W6UJD, **QST**, October, 1949, p. 31.
30. "Plug-In Exciters From Surplus Transmitters," T. Glade Wilcox, W9UHF; Charles Hoffman, W9ZHL, **QST**, January, 1950, p. 54.
31. "Keying the BC-696," Holland M. Carter, W4ADE, **QST**, July 1951, p. 41.
32. "Novice Conversion of a Command Transmitter," R. M. Smith, W1FTX, and W. E. Bradley, W1FWH, **QST**, November, 1951, p. 41.
33. "Command Set Receiver for 6 and 10," Charles L. Faulkner, W6FPV, **QST**, September, 1953, p. 22.
34. "Conversion Notes on the BC-696A," John T. Frye, W9EGV, **Radio News**, March, 1948, p. 57.
35. "Conversion of SCR-274N Receivers," C. W. Roeschke, W5MLX, **Radio News**, June, 1948, p. 49.
36. "Modernizing The SCR-274N Transmitter," Carl V. Hays, W6RTP, **Radio and Television News**, January, 1953, p. 50.
37. "VFO From Surplus," George F. Marts, WØTDH, **Radio Electronics**, January, 1949, p. 38.
38. **Radio Amateurs' Mobile Handbook**, by William I. Orr, W6SAI, p. 166.
39. **Surplus Radio Conversion Manual**, Vol. 1, by R. C. Evenson and R. O. Beach.

SEE ALSO:

40. "Increasing Bandspread on BC-274N Receivers," Arthur Larky, **Inside the Shack and Workshop**, **CQ**, June, 1948, p. 28.
41. "20 and 40 Meters with the BC-459A," W2VNU/8, **Inside the Shack and Workshop**, **CQ**, March, 1948, p. 31.
42. "Keying the ARC-5's," Letters by W1RIF and Herbert Batten, **CQ**, March, 1949, p. 6.
43. "SCR-274N Keying Filter," by W6SAI. **Inside the Shack and Workshop**, **CQ**, April, 1949, p. 36.
44. "Is Your Rig R-f Tight," W2UHH, **QST**, August, 1953, p. 29.

SPURIOUS EMISSIONS

(from page 27)

made to control oscillations which take place near a harmonic of the crystal, and are further multiplied in the output circuit of the tri-tet. Frequencies as high as 200 Mc. are obtainable in the first tube using this method, and weak oscillations as high as 50 Mc. are obtained in the oscillator section. The spurious emissions produced by a multiplier string starting with such an oscillator are, of course, not only few in number, but more easily separated from the desired frequency.

Figure 3. shows the basic neutralized tri-tet circuit for this type of operation, usable with low-capacity crystal holders. Circuit constants may be similar to other tri-tet oscillators, depending upon tubes, voltages and frequencies.

The Butler Oscillator

About 1944, Butler in England and others independently devised a controlled multivibrator type of crystal oscillator circuit somewhat similar to that shown in *Fig. 4.* The crystal is placed between the cathodes of the two tubes—each being parallel twin-triodes in this particular oscillator. Feedback is adjusted by, and controllable with, capacitor *C1.* Increasing the cathode resistors increases power but reduces stability. *R1* was not in the original circuit but has been inserted to control any tendency toward spurious emissions. *C7* provides degenerative feedback. The output may be taken from

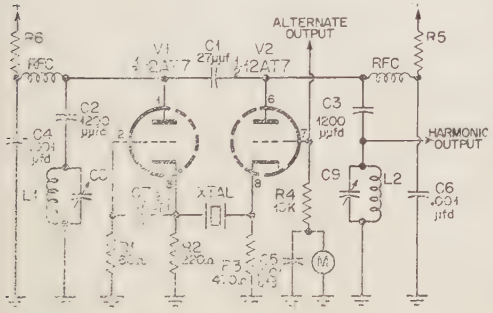


Fig. 4. Wiring schematic of the Butler oscillator. Determine the values of R5 and R6 by experiment. Tune L1/C8 to the crystal frequency and L2/C9 to the harmonic output frequency.

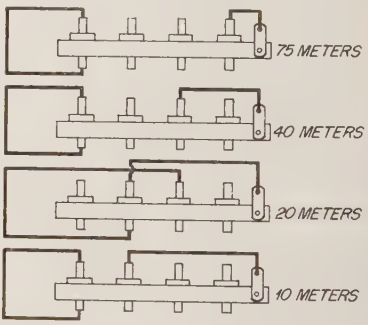
the grid or plate circuits of the right-hand triode. The grid meter shown is an aid to experimentation. The oscillator may be followed by half of another 12AT7 grounded grid amplifier, injecting the drive into the cathode. With another tube as a doubler, 400-Mc. output may be obtained. Like the circuit previously described, the Butler circuit will produce the first, feeble output power on a high frequency, and make the job of separating oscillator-multiplier frequencies from the output an easy one.

6 - BAND ANTENNA

(from page 31)

a frequency of 14,250 kc. Reconnect the antenna and short *L2* with the appropriate jumper. Plug the alligator jumper into the jack on *L1* and set the matching coil, *L3*, for 20 meters. Run the alligator clip up and down *L1* until resonance is indicated by a zero reading on the bridge indicator. As soon as the optimum tap position is located, solder a loop of wire on *L1* at this point. Then, whenever 20-meter operation is desired, the alligator may be clipped to the same spot with no difficulty.

The adjustment for 15 meters is quite simple. Put the matching coil on the 10-11-15 meter position. Remove the bridge from the circuit and feed 15-meter energy directly from the transmitter to the antenna. Find the tap position on the top coil which provides maximum



This sketch shows the correct positions of the jumpers on L3, the matching coil at the base of the antenna. Compare this drawing with Figures 3 and 4.

field strength as shown on a nearby sensitive field strength meter tuned to 21 Mc. As with the 20-meter tap, solder a loop of wire at this point so that it may be easily identified in the future.

No loading coil adjustment is required for either 10 or 11 meters. On both of these bands *L1* and *L2* are completely shorted out.

A word of caution regarding the foregoing adjustments is in order. Before tuning the antenna make sure that the trunk lid is closed and that the whip is fairly well in the clear—well away from power wires and tree limbs.

Since installing this multi-band antenna, I've overheard numerous comments regarding it and have been asked a great many questions about it. Wide-eyed youngsters inquire if I have TV in my car, while curious Hams are anxious to know if the contraption works.

(Continued on page 64)

(from page 62)

Despite a transmitter input of only 15 watts the antenna does a good job on the bands for which it is designed. Most contacts made on 7 are of a ground wave nature with reports equal to or better than those given nearby mobiles employing single-band commercially built trans

FREQ. KCS	L1	L2
3850	NO JUMPER	NO JUMPER
3950	NO JUMPER	JUMPER FROM A TO B
7250	NO JUMPER	JUMPER FROM A TO C
14250	JUMPER FROM D TO E	JUMPER FROM A TO C
21350	JUMPER FROM D TO F	JUMPER FROM A TO C
27000	JUMPER FROM D TO G	JUMPER FROM A TO C
28750	JUMPER FROM D TO G	JUMPER FROM A TO C

Loading coil tap positions for various frequencies in the six amateur bands.

mitting antennas. When conditions have been favorable, satisfactory 75 meter QSO's have been made at distances up to 250 miles.

Almost all 40-meter contacts are with stations more than 300 miles away. Reports have ranged from S5 to S9. Although not too much 20-meter operation has been attempted, a number of excellent ground wave contacts have been made. Little skip has so far been worked. It seems as though every time I try 20 it is either dead or else is loaded with DX. Neither condition is good for long haul mobile work.

At those times when 15 and 10 are open, QSO's via skip can be had with little difficulty. Due to lack of activity on the band, no 11-meter work has, up to now, been attempted.

If you've been looking for an inexpensive, efficient and highly versatile mobile antenna—one which can be constructed with ordinary hand tools—this 6-band job should adequately meet your requirements. Build it and enjoy the fun denied those unfortunate fellows whose antennas restrict them to one narrow segment of the radio spectrum.

TEST EQUIPMENT

(from page 29)

the coils, for overlapping bands, and the calibration. The coil winding problem can be reduced somewhat by the use of a circuit such as that shown in *Fig. 1*. With this type of circuit the coils require no taps or secondaries, which makes pruning easy. For the low ranges almost any pie or bank wound r-f chokes may be used as tuning coils. To isolate the output and give greater stability the oscillator may be followed by a cathode-follower type amplifier.

Calibration

Even though we have reduced the headache of coil winding, calibration is still a difficult

job, unless one has at his disposal a frequency standard of some sort or at least a crystal calibrator. Of course, spot checks can be made by listening on a receiver and beating the generator with stations of known frequency. When calibrating the lower frequencies, such as those below the broadcast band where stations are few, harmonics of the generator can be checked against the broadcast band. For example, if we think the oscillator is in the frequency range below the broadcast region we can look for strong harmonics between 550 and 1600 kc. If a strong signal is found at 600 kc., and in tuning higher another is found at 800 kc., and the next at 1000 kc., it is a pretty safe bet that the generator is on 200 kc. Or if signals are found at 600 kc., 900 kc., and 1200 kc. the generator is very likely on 300 kc. The distance between the strong signals in kilocycles will be the fundamental frequency of the oscillator. When checking in this manner several points should

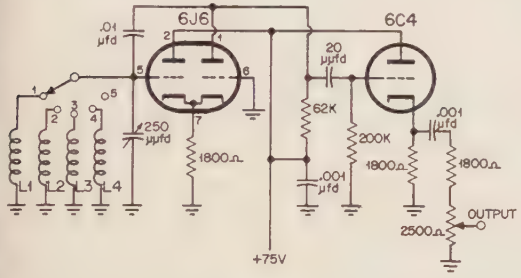


Fig. 1. This is an elementary type of signal generator circuit which has been designed to reduce the coil winding problems.

be tuned each time to avoid errors. This method of calibration is tedious but in due time a fairly complete chart can be filled in.

A useful gadget around the Ham shack is a simple crystal calibrator. Such an instrument is equally useful whether one buys or builds a signal generator, as it is an excellent means of calibrating a new instrument or recalibrating one that has aged. The circuit shown in *Fig. 2* will operate with any crystal from 100 kc. to 10 Mc., or higher. The circuit can be changed from a Colpitts to a Pierce by means of the switch depending upon the type of crystal used. The trimmer can be used to zero-in crystals when checked against WWV. Also some crystals will require adjusting of this capacitor to obtain oscillation. The newcomer should be reminded though that when harmonic or overtone crystals are used they will probably oscillate on their fundamental rather than their marked frequency. Crystals below 10 Mc. will usually oscillate at their marked frequency.

The Ham with a box full of surplus crystals can find a multitude of uses for them. Wide

(Continued on page 66)

(from page 65)

coverage can be had with just a few, as the crystal diode element in the output will generate strong harmonics. A crystal in the 10-megacycle region with proper coupling to a receiver can produce usable harmonics to 500 megacycles or more. In fact a 7.5 Mc. crystal has been found to give harmonics as high as 1800 megacycles when the plate voltage was raised to 300 volts. However, at this high frequency the harmonics were too close together to be of much value to the average Ham. This oscillator is quite tolerant of plate voltage, and around 100 volts is suggested; however, with an active crystal, operation is possible with as low as 7.5 volts on the plate. For uses where harmonics are not desired, the 1N34 crystal should be shorted out.

Attenuators

As mentioned earlier the attenuator is no small part of a good signal generator. In the expensive laboratory models the output of the

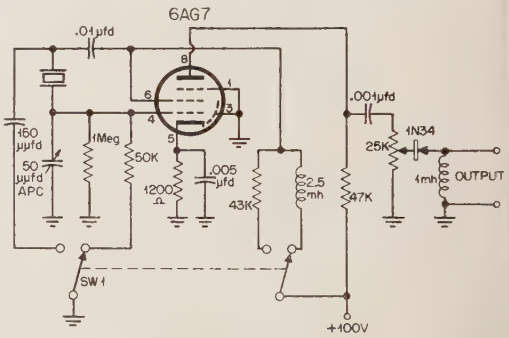


Fig. 2. Crystal calibrator for use with alignment of r-f signal generators. The circuit may be changed from a Colpitts to a Pierce oscillator by switch, Sw1.

generator is fed to an r-f voltmeter with a reference point such as 1 volt on the scale. With the output held constant to this value it is fed to the attenuator. This is just a precision voltage divider which holds its accuracy to high frequencies.

If the oscillator is shielded well enough to prevent a transfer of signal through space or through the associated wiring and *IF* the attenuator is constructed of resistors which hold their accuracy at high frequencies, the input to the receiver under test can be measured in microvolts or even fractions of microvolts. The second "if" is even more difficult to eliminate than the first. For this reason many laboratory generators which range into the very high frequencies have turned to the mutual inductance type of attenuator, sometimes called "wave guide below cutoff." As shown in *Fig. 3*, this consists of just a movable coupling coil which travels in a rigid metal tube. As it moves

away from the signal source the induced voltage falls in a logarithmic manner. This resolves the problem into a mechanical one and figuratively speaking it can be calibrated with a ruler.

Because of production costs the ordinary small generator found in everyday usage concerns itself mainly with the problem of reducing the output to a value which will not block a sensitive receiver, rather than that of giving exact output readings in microvolts.

Use of the Generator

In using a signal source it must be coupled to the receiver under test. This may take on

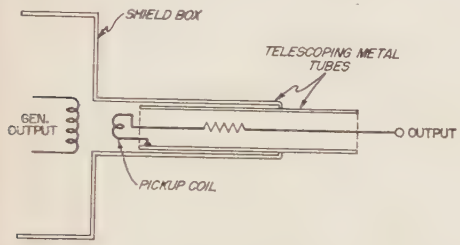


Fig. 3. Mutual inductance attenuator discussed in the text. The output of the r-f signal generator is reduced logarithmically by this method.

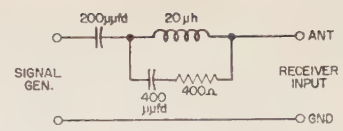


Fig. 4. Standard "dummy antenna" coupling network for use between the signal generator and the receiver or converter.

many variations ranging from a network such as that in *Fig. 4* to the mere expediient of separating the units across the room from each other. The network of *Fig. 4* has been accepted for general use for connecting a signal generator to a receiver or converter. At lower Ham bands and broadcast frequencies it will simulate a single-wire antenna, and from 7 Mc. through 30 Mc. will approximate a 300 to 400-ohm line such as twin-lead.

Although we are not trying to debunk good practices we have found by actual measurement that very few receivers rated for 300 or 500 ohms antenna input even approach this figure except at a few points through the spectrum. In consideration of this it is sufficient in most Ham usage simply to connect a resistor between the receiver antenna post and the hot

(Continued on page 68)

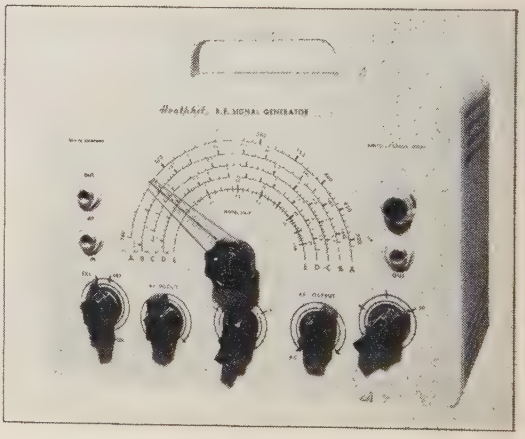
(from page 66)

lead of the generator, and then ground the generator to the receiver chassis. For receivers with a co-ax input, such as RG-8/U, a 50-ohm size should be used; for those with a 300-ohm input with grounded center tap the signal can be fed between ground and one side through a 150-ohm resistor. These should be carbon resistors.

In many cases coupling with a small mica condenser in place of the resistor will be adequate. The main object is to prevent the low output impedance of the generator attenuator from loading the input tuned circuit to the point where alignment will not remain the same when the generator is removed and the antenna is connected.

The *Heath Company* has attracted considerable attention by their approach to the problem of low cost test equipment by means of the *Heathkits*. Because of this we have been investigating a number of the kits in connection with this series of test equipment for the amateur. For those interested we would like to mention in passing that any statements made have not been influenced by the *Heath Company* as the writer has had no contact with them regarding this series of articles.

The kit which falls under our heading this month is the *Model SG-7*. This r-f generator covers a range from 160 kc. to 52 Mc. on funda-



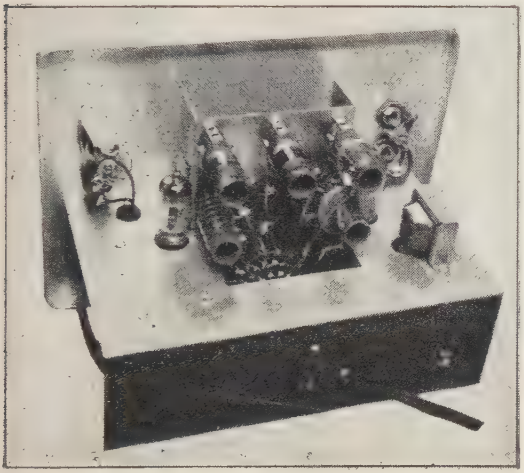
This is the Heathkit Model SG7 generator.

mentals and is calibrated to 156 Mc. If one cares to use a diode crystal across the output, signals far into the kilomegacycle range are available. The calibration is spread over six bands and this combined with a smooth vernier dial affords easy tuning, even on high bands.

For those interested in the circuitry, the oscillator is a 6C4 Hartley. Modulation is accomplished with another 6C4 as an audio oscillator or as an amplifier if external modulation is used. Internal modulation is at 400

cycles. A jack is provided to facilitate external use of this audio if desired, and about 2 volts are available. When modulated from an external source approximately 5 volts are required. By using tubes with low current heaters and a selenium rectifier, heat in the cabinet is kept to a minimum, thus reducing drift. This unit has a power transformer which helps to prevent leakage through the power line.

The output is taken from an attenuator which is of the combined step and vernier type and except on the highest output step at the higher frequencies will have little effect upon the frequency. There is some r-f leakage through the cabinet on the high bands. However, because of the great increase in price which would be caused by complete leakproof shielding, the present unit seems to be a justifiable compromise.



Switch-type construction as used in the Heathkit.

For those who missed the first of this series, an attempt is being made to present material strictly from the view-point of Ham radio requirements and not from that of the precision laboratory worker. The subject of 'scopes will be next month's attempt to compress a jugful of information into a one-capsule dose.

PROPAGATION

(from page 41)

sunspot number is predicted to be approximately 6.

During 1953, usable frequencies also continued to decrease with the ten meter band generally useless for ionospheric propagation (except Sporadic E, short skip) and with the 15, 20 and 40 meter band less useful than in previous years.

Ionospheric absorption decreased somewhat during 1953, and this resulted in the nighttime (40 and 80 meter) bands opening earlier than during previous years. For example, the 40 meter band opened between New

(Continued on page 70)

(from page 69)

York and Europe as early as 2:30 PM EST during fall and winter months, with occasional openings as early as 12:30 PM EST during late November early December.

In general, 1953 was a year of continued decrea the DX potentialities of the amateur 10, 15 and 20 bands. Lower usable frequencies and decreased ionosp absorption averaged out so that DX conditions on 8 160 meters are believed to have actually improved s what during 1953, with conditions on 40 meters proving during the early evening and early mo hours, but becoming poorer during the late ev hours.

Post Analysis of DX Contest

A number of reports have been received from CQ ers who used the special September and October p tions during the recent World Wide DX contest. following from Bill Case, W5FNA, typifies these re "... but your predictions helped make maximu of the short time available. The predictions were accurate, particularly on 21 Mc."

In general, both contest weekends occurred relatively quiet radio propagation conditions, wit CW weekend actually occurring during a relatively period.

The October CQ forecast predicted that propa conditions during the phone period would be norma sandwiched in between disturbed periods. The Nov CQ forecast predicted that the CW contest period occur during a good propagation period.

Based upon reports received by the Radio W Service of the Central Radio Propagation Labor actual radio quality observed during the contest has been estimated as follows:

October 24—Started poor becoming fair to good.
October 25—Started fair becoming good.
October 26—Started fair becoming poor.
October 31—Started fair becoming good.
November 1—Good.
November 2—Good.

Therefore, unlike the previous three CQ DX co significant ionospheric disturbances did not occur the post World Wide DX contest, and propagatio ditions were generally fair or better.

THE NOVICE SHACK

(from page 39)

Pvt. Ronny E. Harris, RA17393763, Co. D, 1 Reg't., Ford Ord, Calif.
Johnny Jarvis (14), 610 S. Sunny Slope Ave. Frankfort, Ill.
James Greer (30), Box 346, Camp Wood, Texas
Carlton Yaffey (12), 5215 Argall Ave., Norfolk phone: 41586.
Seymour Lanton, 85 Bristol St., Brooklyn 12, N
Larry Mitchell (16), R.D. #3, Ithaca, N.Y. 41770.
Bruce Kibler, Jr., Box 201, New Castle, Va.
Bill Heitritter, 1114½ Virginia, Sioux City, (Also wants pen pals interested in radio.)

More Letters

Jim Rogers, WN5CFZ, General Delivery, R Texas, writes, "Dear Herb, I have been on the a weeks and four days. I have been able to wo 7 stations in 2 states. I am using an S-38C a 6L6 transmitter running thirty watts, and a folded dipole fed with 300-ohm ribbon. My frequ 7185 kc. I think that I should have better luck have been having. Any suggestions?" **(Jim's tr probably the result of using a 3.5-Mc. folded di 7 Mc. A folded dipole is essentially a "one-ba tenna, although a 7-Mc. one works o.k. on it harmonic—21 Mc. Cutting antenna length to s feet or transferring operations to the 3.7-Mc. band are two solutions. I have received several recently from other Novices with exactly the sam plaint—Herb.)**

Norman, KN6ANE, writes from Placerville "Dear Herb, After hearing some of you city complain, I thought I would tell you my tro live in the Sierra Nevada Mountains, where radi

(Continued on page 72)

hapter One

Regulator Adjustment

Batteries

Automotive Electrical Systems

Chapter Two

PE—103A

Mobile Power Sup

High Power Supply

Remote Tuner

PE-101C

75-Meter V.F.O. Transmitter

Chapter Three

Safety in Operation

Converter

Mobile Receivers

Converter Installation

12-Watt Mobile

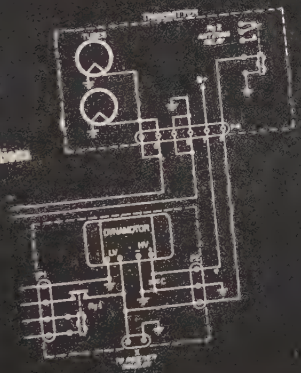
3-Band Transmitter

Chapter Five

"Mobile Special"

Mobile Transmitters

Speech Considerations



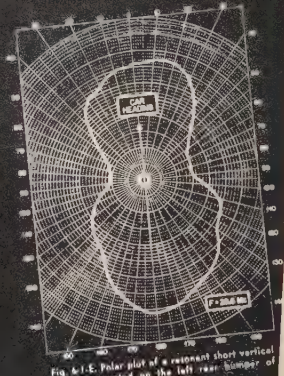


Fig. 6-1. E. Polar plot of a resonant short vertical antenna mounted on the left rear bumper of an automobile.

160-Meter Loading

apter Four

Shunt Limiters

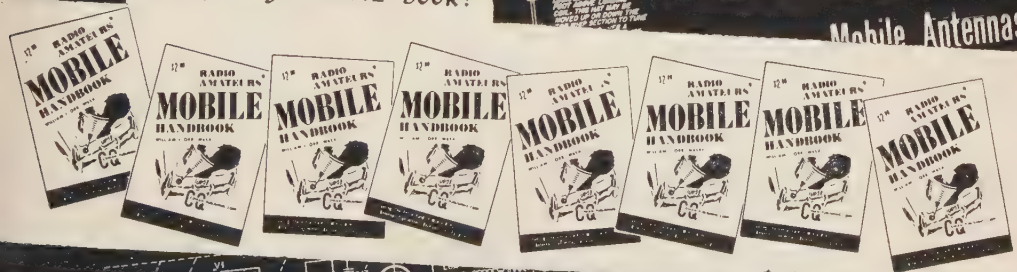
Noise Suppression

Speech Clipping

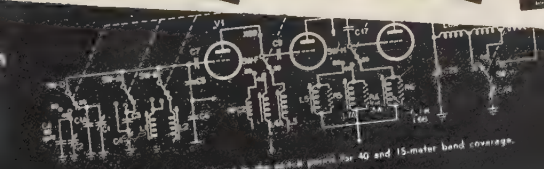
Chapter Six

Mobile Antennas

Everything in ONE book!



$2.00



40 and 15-meter band coverage.

Chap even

Test Equipment

Grid Dip Oscillator

(from page 70)

tion at best is poor, and my shack is at the base of a 2000-foot ridge that stops most of my signals. I had to cut down several trees to make room for my antenna which is 60 feet long and 50 feet high. My rig is a Lettine 240, running 40 watts, and the receiver is a used RME 45. I have made 150 contacts in 5 states on 3.7 Mc. Best DX is 1,000 miles. But, in the winter, I cannot be sure whether I will finish a contact or not, because the power often goes off because of strong wind or snow. I am nineteen and travel 100 miles a day by bus to attend Sierra College. No, I do not have TVI, hi."

Let's squeeze in just one more letter. Gary, **WN7UXP**, reports, "Dear Herb, I have had my ticket one week now. My first QSO was with KN6AYJ, and my best DX has been W2CJX. So far, I have had 42 contacts in 8 states, 5 confirmed. My transmitter uses 6Y6—6V6—6V6—6L6 at 45 watts input. Antennas are doublets for 3.7 and 7 Mc., and the receiver is an **RME 45.**

See you next month, and why not drop me a note before then? 73—Herb, W9EGQ."

DX NEWS

(from page 35)

in EA9DD for No. 219 while W6CYI also added Luis and TI9UXX to reach 216 . . . **G8IG** added EA9DD for No. 212 while **W6BIL** hooked CR6AI for his 137th . . . **W2NSZ** reported CEØAA and EA9DD to reach 232. F18's are still verboten Weldon . . . **KV4AA** can't kick about November when he finally added KAØIJ along with C3BF, ZC3AB and AC4NC!! . . . Al, **W2WZ,** went to 231 with LB8YB and **W3DPA** came up to date to reach 230.

W1JYH goes to 219 with CEØAA and EA9DD . . . Rex, **W5MPG,** keeps right up to date with VQ9UU, VS9UU, VQ7UU, EA9DD and CEØAA to reach 214 while Roy, **VK4FJ,** adds CT2BO and EA9DD for 207 . . . Ray, **W2BJ,** goes to 205 with VQ1NZK and EA9DD . . . **W2EMW** keyed with EA9DC, VS2CP and VP8AK to raise his total to 198 while Roy, **W6LW,** goes to 196 with ZS8D and TI9UXX . . . Joe, **W6GPB,** hits 186 by adding CEØAA, OY2Z and LZ1KDP . . . **W9ABA** snagged EA9DD and I1BLF/Trieste for 176 while Tom, **TI2TG,** climbs to 215 with FI8AE and ZS9G. The latter gave him 179 on 'phone only . . . Gus, **W2HMJ,** pushed to 206 with EA9DD while Juan, **KP4CC,** also added Luis plus TI9UXX for 193 . . . **OE1FF** grabbed MP4ABW A3 for his No. 145 while Sam, **W3AXT,** steadily climbs upward with ZK1AB, KB6AY and OE13USA to reach 151 . . . John, **W6BYB,** enjoyed Oct. with OD5XX, ST2AR, 5A1TM, ZD4BJ, YU1BCD, YN1AA, CT3AB and VQ3EO to reach 157 . . . Mickey, **W8YIN,** with new El-Bug and beams snagged ET2ZZ, KF3AB, EA6AF, VQ3EO, 3V8AN, VS2DH, ZS9G, LB8YE and EA9DD for 168.

Miles, **W6ZZ,** is gunning for that KH6-100 Certif. So far 349 QSO's with 132 KH6's but only 73 cards to show for it . . . **W7AHX,** Geo., nabbed OK1MB, VK9GM, VK9WZ, DU7SV, HP3FL and many others on 7 Mc. while 14-Mc. A3 accounted for such as CR6AI, VP3YG, OX3BD, EL6A, OD5AD, OH2OV, OE13RB, KAØIJ and the usual run of JA's, KA's and ZL's . . . Ev, **KP4KD,** awaits QSL's from MP4BAU, VS9AP, ZK1AB, OD5BH and VQ1NZK to give him that coveted DXCC-200 . . . Rag, **W5TLY,** gave his vertical a workout on 7 Mc. and came up with VP2KO, VP4LZ, VP6CJ, VP7RO, VP8AX (Rod, South Shetlands), PJ2AJ, HH2OT, TI9UXX, CX4OW, FK8AO and OK1MB . . . Dave, **W1WAI,** and his **Viking** accounted for TF3SG, 9S4BS, ZB1BJ, YV5AB and EA9DD for a total of 55 . . . **HR1AT** added KR6LP on 14 Mc . . . YK1AH was No. 181 for **VK3CX** . . . **W2DRD** nabbed ZS9AA who claimed to be a ship near the South Pole!! . . . AC4NC was heard QSO'ing **ZL1BY, VK5MS** and **ZL2GX** . . . **FK8AO** says best time for **FW8AB** is on Sundays at 2300 GMT, 14080 . . . **W7KVU** has been exploiting 3.5 Mc with these results: DL3DU, SP3AN, DL6NR, OK1DC, OK1MQ, G2RU, ZK1BG and, at 1407 GMT, 3510, VU2KL.

W7AAT picked up CR6CS for a new one while **LU5AQ** went to 163 with such as EA9DD, VR4AE, VK1BA, FK8AO, JZØKF, VR2BZ and C3BF . . . **W4CEN** added VK9GM, CR5SP and was the first W to QSO VQ7UU . . . **W4ZAE** came up with VP2MD, CR6AI,

(Continued on page 74)

(from page 72)

VP1RO, CR7IT and KR6AA to reach 90 . . . **W5AV** added LB8YB while VQ2AB was a new one for **CP1E** . . . HH2FL was No. 147 for **ZL2GS** while **LU8NA** add KAØIJ . . . Harry, **W3IL,** keyed with VQ3EO and CR6 . . . **OH2RY** reached the 200 mark with HH2LD . . **CO2OM, CO2CT** and **CO2OE** all added CEØAA . . **W6LW** and **W2FMF** came up with one AC5AA on 35 around 0050 GMT hmm-m-m? . . . With assist fr LZ1DP, **W8PQQ** received an overdue QSL from UA1KE . . . **K6CEF** got up a 3-element beam and snagged C3B **EL7A** and **DU7SV** while **VK3JA** and **VK5DB** hook HK3FF on 090 . . . **WØHVN** returned to 7 Mc. after 20-year absence and promtly hooked LB8YB . . . **SM8L** Gunnar, puts S8 sigs into the Caribbean area while sa ing from Madras to Calcutta . . . Fung, **VS6CG,** add CM9AA to his totals . . . **VK2QL** pulled a three-ho WAC with his 30-watter on Dec. 6 . . . **W2FBA's** ne two-element 7-Mc. beam is getting out nicely. The el ments are 55 feet long and driven 135 degrees out phase . . . Frank, **W2WC,** added these new ones on Mc: CR4AG, EA9DD, ZK1AB and LB6IE . . .

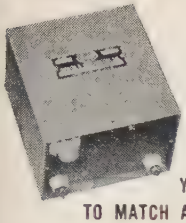
Here and There

DL7AH changed QTH from Berlin to Munich but h call will stay the same . . . W8HWZ/6 is now **K6CME** Modesto, Calif . . . W1GD, Willis, now may be heard **W1GD/MM** on a coastwise tanker . . . **VK1EG** has ha QSL's printed prior to his departure for Antarctic They will be available from VK4FJ . . . **W8HMI** has countries since last June and will soon get down serious business with a new kilowatt rig . . . Te **CP1BX,** closed down for good on Dec. 10 and will heard next from TI2BX in March. He is chief of th CAA mission in San Jose . . . **W6DZZ** looks forward to fine DX future from new QTH overlooking San Francis Bay . . . W8NBK informs us that **EA9DD** (EA4BH) ha sent out 2247 QSL's which cover things 100% . . W6JKH/2, Paul, is now **K2GFQ** and has worked 1 countries from Rye, N.Y. . . . HR1AT received QS from **VQ3EO** bearing QTH as follows: Paul Stei Murongo Mines, 13, Tanganyika. QSL QTH is in th Jan. issue . . . Ron, **ZL2RC,** was QSO'ed from W4EJ He will be there until the end of Jan. . . . Jack, e VO6X, may now be found behind the key at **VE3DS** . . . **W4UX** is back on the air from Jax. Fla. he ha been on at SU1US and HZ1AB . . . **K2ECY** was OX3H in '51 . . . The Vicksburg tornado missed W5AVF's hom by only three blocks. Fred said it looked like an A-bom had hit the place!

OH2RY is in a new apartment QTH and plans som nice long VEE antennas when the snow disappears . . From **W6BYH** we hear that the Delano, Calif. Club plan an award for working a certain number of Delano sta tions including the club station K6BLL. 22 members ar available most of them working at CBS-KCBR. The include W6's BRP, BVM, BYH, EFV, FHC, GNR, HT HYK, JOU, ARI, UJZ, WNX, ZVP and ZEK. Officer are Fred Whittaker (W6-to be) Pres., W6ZVP Vice-Pres W6BYH Sec'y, W6ARI Treas., W6BVM and W6BR Directors. Members W6MJG and W6LBN are now i DL4-land and W6IDZ is with VOA in DU-land. Th VOA station, KCBR runs a mere 200,000 watts . . **CEØAA/CE3AG** states that he has sent QSL's for a those received. This amounted to over 1000 up to Nov 15. Luis wishes it known that contributions for th purpose of establishing a permanent station on Easte Island are absolutely voluntary. Such contribution wil result in a card with photo from CEØAA via airmail Other QSL's go via bureaus . . . **PJ2AA** returned t PJ-land in December after a long European vacation . . **ZE3JP** will be in England from March to August this year. Dick is very active on 21 Mc. and has completed WAC on all bands from 3.5 to 28 Mc. . . . **W6RW** sug gests separate certificates for each band with DXCC an WAZ. This is a natural for DXCC but would be a bit too tough for WAZ . . . From the **So. Cal. Bulletin** we see that **W6HPV** has a new pi-network final underway using a 4-1000A and **W6KSF** is about to christen a 450TH. **W6AM** attended a meeting of TG Hams while in Guatemala and had slides taken . . . Upon reading our item that **EL2P** was off the air due to the death of Jock we received a hasty card from Les, EL2P, who assures us that EL2P is still going strong. Jock used to handle the A3 side at EL2P.

W1WPO, ARRL, advises us that **FW8AB,** Wallis Island, is attached to FK8, New Caledonia, and is counted as same . . . Tex, **KAØIJ,** advises that he will change QTH's to KA2-land shortly and will be looking for all

(Continued on page 76)



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- HIGH SIGNAL-TO-NOISE RATIO ON RECEPTION

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Weight—less than 3 lbs.

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Weight—less than 3 lbs.

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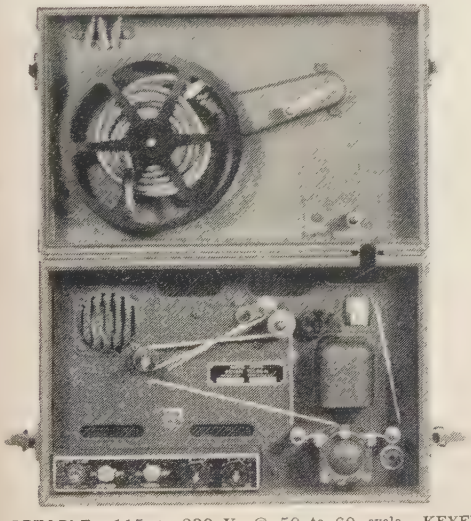
237 Fairfield Ave., Upper Darby, Pa.

TG-34A KEYER



PORTABLE—115 or 230 V. @ 50 to 60 cycle—KEYER TG-34A is an automatic unit for reproducing audible code practice signals previously recorded in ink on paper tape. By use of self contained speaker, unit will provide code practice signals to one or more persons or provide a keying oscillator for use with a hand key. Unit is compact, in portable carrying case, complete with tubes, photo cell, and operating manual. Size: 10-9/16" x 10½" x 15-13/16". Shipping weight: 45 lbs. BRAND NEW—in orginal box— **$24.95**
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PE-101 DYN.—6 or 12 Volt. (Reprints of original CQ conversion articles—Oct. & Dec., '52 issues—furnished.) This is the Dynamotor the Hams have been talking about! Easily adapted to supply 625 V. @ 150 MA. and 325 V. 125 MA. @ 12 Volts—or 300 V. 90 MA. and 160 V. 110 MA. @ 6 Volts. NEW: **$4.95**

COAXIAL CABLE—RG-8/U (Special) 51.5 ohm. Same size as RG-8U. Prices: 1 to 100 ft. at **8¢** per ft.—100 to 500 ft. at **7½¢** per ft.— 500 to 1000 ft. at **7¢** per ft.—1000 ft. Rolls at **6½¢** per ft. **RG-34/U**—71 ohm, 145 ft. length **$15.00.**

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(from page 74)

the lads from that QTH . . . **OE1FF** states that the Austrian authorities have received the right to issue licenses at last and calls should be coming through as this is read. In the meantime Club licenses will be issued in which the first letter of the call, after the numeral, will be an "X" such as OE5XG, OE1XA, etc. They do not intend to issue calls which have been used under cover but attempts are being made to change their minds . . . A flash Sou'easter with gusts at 60/70 knots put two feet of water in **W1ZL's** shack. A little baking put things right again without too much damage done . . . From the FOC Bulletin we note that G3BRV recently operated a rig "steam driven." He was able to QSO eight countries with input varying from one to ten watts. A dinghy hand generator was driven by two ¼ hp. steam engines purchased from surplus . . . Congrats to **F8BS** on the arrival of a new Jr. op in October . . . W6GIZ has taken over the writing chores for the North Calif.

160 Meters

The February Transatlantic Tests will be held on Feb. 14 and 28 from 0500/0800 GMT. This is being written just prior to the test run of Dec. 20 and we hope to report on them in the March issue . . . We are happy to note top band QSO's as follows: Oct. 16 **G6GM/ZL1AH**; Oct. 17 G6GM/ZL1AH; Oct. 21 G6GM/ZL3RB; G6GM/ZL1AH. Two further QSO's took place, same stations on Oct. 22 and 23 . . . **G3PU** snagged W3RGQ at 0505 GMT on Oct. 4 for what was probably the seasons first W/G QSO. G3PU was on 1840 kc. G3PU also worked W1LYV on this date and **G5JU** came through with QSO's with W1LYV, W3HL and W3RGQ . . . Oct. 8 accounted for a QSO between **G5JU** and W3RGQ followed by contacts on Oct. 11 by G3PU with VE1EA, W1LYV and W3RGQ. On Oct. 30 G8JR QSO'ed W3RGQ . . . **ZE3JO** and **ZE3JP** are organized on 160 and will be trying hard during the tests . . . **KP4KD, EI9J** and **GC2CNC** will be in there . . . **VP4LZ** will also be active for that South American QSO . . . **KV4AA** will probably hang out on 1823 kc.

Fifteen Meters

Conditions remain spotty on this band. Many think this seemingly dead band could be brought to life with a few CQ's. It's a case where everyone is just listening and concluding that the band is dead . . . **TI2TG** came up with his No. 100 by snagging ZS9G on A3 . . . Ross, **W4DOU**, A3'd with such as TA3AA, YI3WH, SU1KB, VQ4RF, ZS9G, FF8AP, GD6IA, G3BXI, PAØIDW, F3YE and CR6BX . . . **GD6IA** reports 96 countries on 15 and **G3BXI** reports activity from VS6CL, 21,262, VU and CR9 on A3 . . . **ZE3JO** and **ZE3JP** are very active here . . . **GW3AHN** goes to 85 countries while **KP4KD** reports band as not much good for the Caribbean area in November . . . DX QSO's at **W7AHX** include (on CW) such as KG6ADY, KX6BF, OQ5CP, CR7AF, XE1OM, KR6AA, CP5EK, VP9BG and KG4AN. On Oct. 24 George nabbed FU8AA at 2117 GMT on 21,092 CW. 7AHX's A3 brought in G3BXI, VK9YT, VP5SC, ZS6ME, KV4BD, ZP5AM and a host of others . . . Miles, **W6ZZ**, added KW6BB on A3 to reach 60. Other A3 contacts were DU7SV, JA1CO, KX6BB, ZS9G, ZE2JK, KP4TA and many others . . . **W1BUX** went to 75 with ZD4AB . . . **G5BZ** goes to 91 for the leading G station but says G2PL is well over the 100 mark.

LATE ADDRESSES

CE5CT, Box 229, San Martin, Concepcion, Chile.
HH2OT, Herb, Box 1027, Port-au-Prince, Haiti.
ex-KAØIJ (1951/2), Larry Arcement, 53 Jackson St., Ocean Springs, Miss.
KB6AY, Fred Carpenter, Box 1, Canton Island, Pacific.
KH6ASU/KM6, Box 19, USNS, Navy 3080, F.P.O. Postmaster San Francisco.
KJ6AZ, Dale, APO 105, Postmaster, San Francisco.
MP4BEN, Dukhan Airport, Qatar, Persian Gulf.
MP4BUS, Ummsaid, Via QPC,, Persian Gulf.
SP2KAC, Kadhowski Stanistow, NL Kopevnika 18, Gdansk, Poland.
TI2BX, (After March 1) Ted Westlake, c/o US Embassy, San Jose, Costa Rica.
VP1RO/VP7RO etc., Via G2RO or RSGB.
ZC3AB, Dave Laing, Christmas Island, via Malaya.
Thanks to No. Calif. Bulletin, W3AXT, W5RX and W4ZAE.

73's Dick KV4AA.

Sneaking a Look at the Future

CLASSIFIED ADS

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TVI MONITOR, compact 7" set $35. Larger screen, $40. Want Eldico or Multiphase SSB Exciter. W4API, 1420 South Randolph, Arlington, Virginia.

SELL 32V-1 transmitter $325. W4GKI, Austin Drive, Columbus, Georgia.

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SELL MEISSNER 150-B with Signal Shifter complete, no reasonable offer refused, FOB, South Bend, Indiana. Robert G. Kasa, W9OGZ, 821—24th Street, South Bend, Indiana.

PAIR OF NEW 814's, never used, $10. Brand new 813 $8.50. Globe Scout transmitter complete with coils, $75. Will ship. Roger Aden, W9UZP, Golden, Illinois.

BALUN COILS, type B & W #3975, mounted on 7 x 9 x 2 chassis and wired for use to match 75-ohms unbalanced to 300 ohms balanced lines, $12.95; mail orders please include $1.00 for packing and postage costs. Evans Radio, P.O. Box 312, Concord, New Hampshire.

SELL OR TRADE: Mobile transmitter, Gonset Tri-Band, Argus C-3 camera. Want: press or reflex camera, enlarger. R. Queen, Route 7, Spartanburg, South Carolina.

FOR SALE—complete station consisting of a WRL 50-watt 6-band transmitter, voice and CW, all coils and Novice crystal included, plus antenna tuner and National SW54 receiver, phones and a Triplett wave meter. $100.00. Raymond Schmidt, 568 Columbus Avenue, New York City. Phone TR 7-8307.

SELL, Collins transmitter type 32RA in operating condition. Complete with tubes, mike, 20-10-80 coils, phone or CW. $125. W7IWC, 522 North 120 Street, Seattle, Washington.

BEST OFFER on following new parts: Eimac variable vacuum condenser VVC-60-20, set 10-meter coils for Super Pro, Johnson butterfly condenser CX45B, Eimac 1-65A tube and socket, Astatic DK-1, Bliley CCO, surplus 12-henry 500-mill filter choke and 2-813 tubes. Bob Guercio, 910 South 8th Street, Lawton, Oklahoma.

CLEANING SHACK. DB-20, good condition $20; BC1206 LF Beacon receiver, new, $8; BC357-G VHF Beacon receiver, new, $5; electronic 110-volt DC-AC converter, 200 watts, used, $15; AN-CRT-3 "Mae West" emergency transmitter, new, $10. Dynamotors: PE-94A used $7; PE-86N new $3; DY-21-ARC, three, new, $5; DM-21-B, new, $5. Postage extra. George Jacobs, W2PAJ, 144-10 72nd Avenue, Flushing, 67, New York.

SX-71 LIKE NEW, $150; BC696-A perfect, $25; TBY transmitter receiver, 28-80 Mc, some tubes missing, $20; Wilcox CW3 receiver, $20; ABK-4 receiver, like new, easily converted 144-220 or 420 Mc., $15, BC654-A, receiver, 3800-5800 kcs., minus case, $10; PE-101-C dynamotor, brand new, $3.50. Want: ART-15 transmitter and parts. W1KJO, 29 Pine Street, Bedford, Massachusetts.

BARGAINS: EXTRA SPECIAL: Motorola P-69 series mobile receiver $19.50; Gonset 10-11 converter $19.95; DM-36 10 meter converter $19.50; VHF-152 $49; HF-10-20 $49.50; S-40A $75; RME-45 $99; RME 2-11 $99.50; HRO-senior $99; SX-43 $119; S-76 $149; SX-71 $169; SX-42 $189; HRO-50 $275; 75A1 $275; MB611 mobile transmitters $14.95; 90800 exciter $22.50; HT-17 $32.50; EX Shifter $69; Globe Scout $69.50; Globe Trotter $69; TBS-50D $99; HT-9 $199; Supreme AF100 or Temco 75GA $225; Globe King $295. Free trial. Terms financed by Leo, WØGFQ. Write for catalog, and best deal, to World Radio Laboratories, Council Bluffs, Iowa.

FOR SALE CLEANING SHACK: ARC5 xmtrs convert to 160M $10, 2M $20, BC457 for 80M $10, BC458-A for 40M $10, BC459-A for 40M $12. ARC4 xmtr-receiver for 2M $25. Preamplifier BC1284-A $5, AYD3 xmtr-receiver $5, BC456-A modulators $3, all complete, some new. Also RCA receiver 15-600 kc. $5, UTC kw plate transformer $25. Will ship postage collect. Dan Johnston, Viewmont Terrace, Little Falls, New Jersey.

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MOBILE HAMS. Carter Magmotors model MV280, 5.50DC, 5.8 amps and 200VDC, .080 amps output. Fine for mobile receivers. Just a couple left. $6.00. Art Winters, 11 Warren Street, New York 7, N.Y. WO 2-7955.

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NEED: BC348 and BC342 radio receivers. Hoffman, 1406 G Street, N.W., Washington, D.C.

WANT: AN/ARC-1's, AN/ARC-3's, BC610-E's and components. Write—B. Spivey, 7013 Rolling Road, Chevy Chase, Maryland.

WANTED: B&W low pass filter, 150 ohms, model 300, catalog number 417. Will pay cash or trade. WØEHF, 2558 Ida, Omaha, Nebraska.

WANTED: Latest model Pilot Miniature TV receiver. Want best possible condition. Must work perfectly. Write price and description, Bill, K6BSW, 133 North Valley Street, Burbank, California.

WANTED: AN/ART-13 transmitter and/or parts. Robert Weggelin, 410 Cedar Street, N.W., Washington, D.C.

WANTED: RCA 5527 Iconoscope. W4SOD, J. E. Howell, Box 126, Lumberton, North Carolina.

WANTED: Complete equipment or parts of BC610, ART-13, ATC, TCS, RTA-1B, ARC-1, ARN-7, BC348, BC312, BC342, BC221, LM, teletype. Any model Collins receivers or transmitters. Manuals. Test equipment. Will take your old equipment in trade for new amateur equipment. Write or phone Alltronics, Box 19, Boston 1, Massachusetts. RIchmond 2-0048, 2-0916.

WANTED: BC348 receiver and parts. Write, James S. Spivey Co., 1406 G Street, N.W., Washington 5, D.C.

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